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ELECTRICAL WORLD

MARCH 8, 1930

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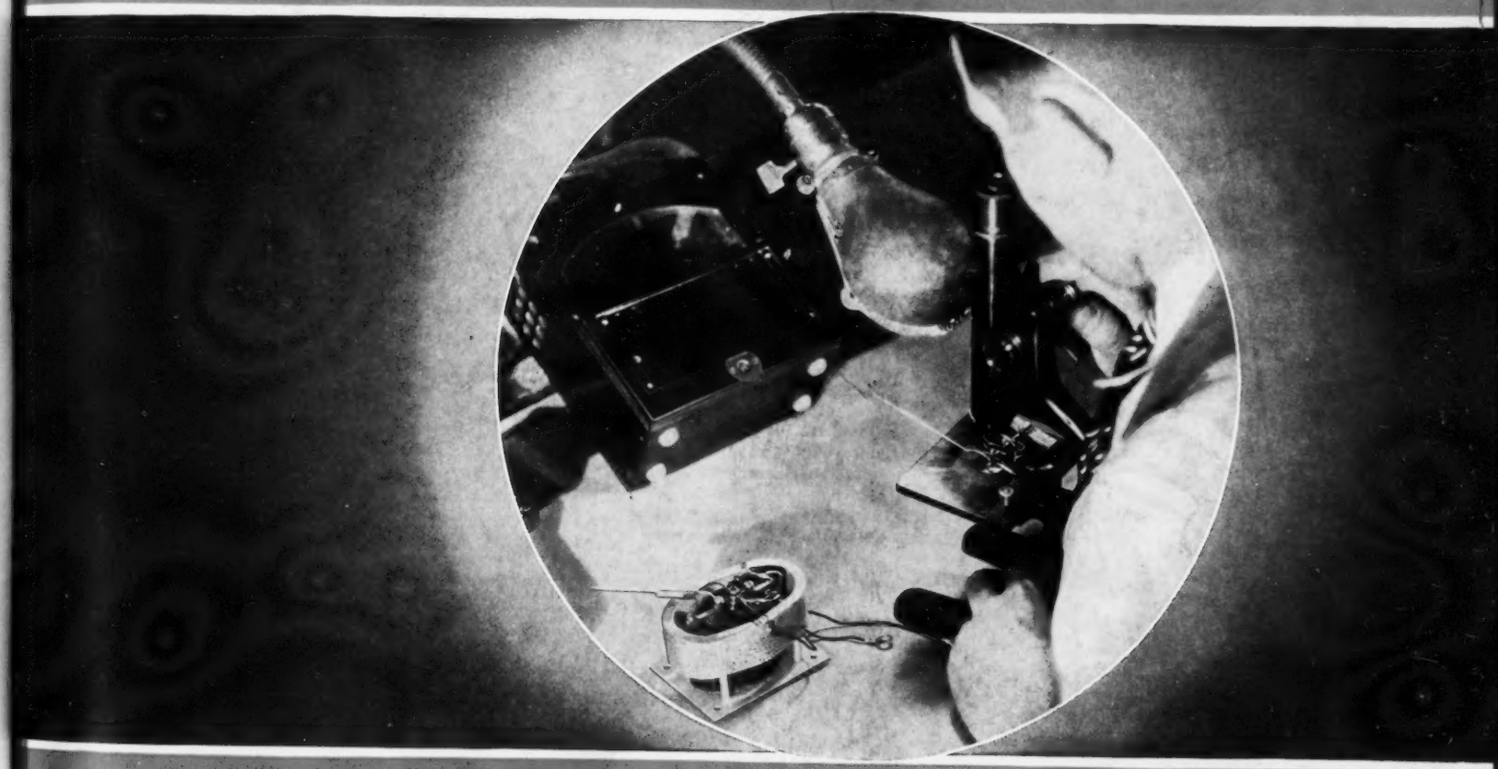

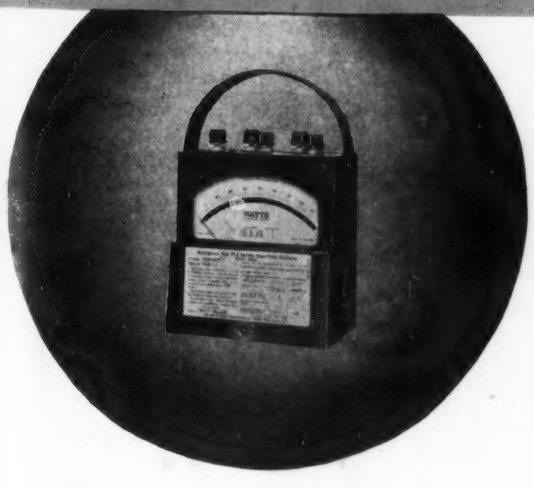

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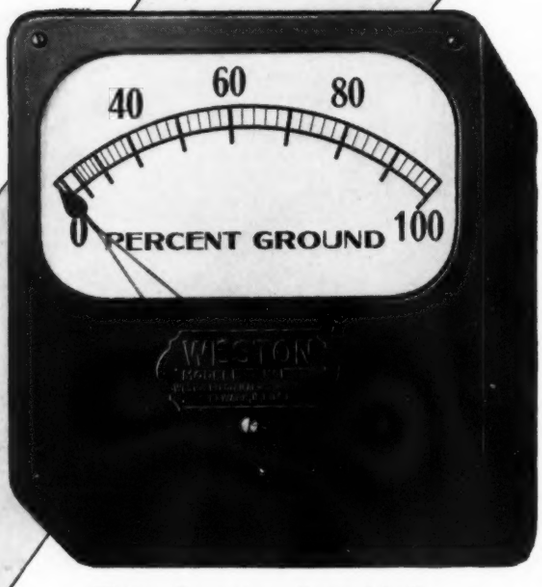

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VOLUME 95 . . . NUMBER 10

News of the Industry 469

Motor Starting Power Factors 482
By W. B. SHEPPERD, *Century Electric Company*

Russia as an Electrical Market 485
By A. B. DIBNER, *Burndy Engineering Company*

Line Extension Rules Prove Sound 493
By C. MAYNARD TURNER, *Department of Public Works, Olympia, Wash.*

Rate Function of Federal Court 497

Hell Gate Station Design 500
By W. E. CALDWELL, *The United Electric Light & Power Company*

Editorials 479
Network System Load Testers 484
Light—A Tool for Seeing... 488
Protection and Accessibility of Rural Service Meters..... 489
Night Football Is Practical... 490
British Grid Scheme Progressing 491
Outdoor Substation on Simple Lines 492
Handling Reel in Mountains Easily and Cheaply 495
Ice Made and Delivered Electrically 496
Novel Bracket Type Floodlighting 505
Electric Heat Economical for Isolated Offices 506
Book Reviews 506
Financial and Statistical 509
New Equipment 516

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ELECTRICAL WORLD

for the Week Ending

March 8, 1930

Comment On the News

THE LATEST MOVE of Senator Wheeler is to tie President Hoover to the "Power Trust" and insinuate that the American committee of the World Power Conference is a creature of the octopus. What next?

ELECTRIC LINE WORK has lost a good deal of its reputation as an ultrahazardous occupation in the Framingham (Mass.) division of the Boston Edison company, where a maintenance crew of thirty-five men has just completed four and one-half years without an accident serious enough to cause lost time. This splendid record shows that even a group of seasoned "pole climbers" may become "safety-minded."

KENTUCKY'S LEGISLATURE has accepted former Senator du Pont's offer to buy the site of Cumberland Falls for conversion into a public park. If nothing occurs to nullify the legislative action, the scenery preservationists thus win this widely advertised contest and the Federal Power Commission gets rid, without action, of a situation that has long troubled it. A similar victory for scenery was won about fifteen months ago in the case of the Royal Gorge in the Arkansas River, and another seems probable over the Great Falls of the Potomac. Perhaps the moral is that developers of hydro-electricity must go slow in such locations, however strongly convinced they may be that power is not necessarily destructive of beauty.

ALTHOUGH NEW YORK'S Public Service Commission is only one of forty-eight state regulatory bodies (including the District of Columbia), with varying degrees of authority and scope of jurisdiction, the size of the Empire State, the enormous capitalization of its utility companies and the age and history of the firmly established commission in question lend national importance to the reconstitution that seems certainly to be coming. Much less sweeping, naturally, are the views of the similar legislative commission which has just reported to the Massachusetts Legislature. The prudent investment theory is already the sheet anchor of rate-base ascertainment in the Bay State, and the Massachusetts investigators did not split on that point as did their New York confrères.

NEWS OF THE WEEK

Couzens Committee Concludes Inquiry —A. G. & E. Still on Carpet

ONCE more the Federal Power Commission was under scrutiny at Washington this week, Wednesday's session—the last—being an especially interesting one. Concurrently the Federal Trade Commission pursued the financial end of its investigation, delving further into matters concerning the American Gas & Electric Company and its subsidiaries.

•

Secretary Wilbur an unperturbed and ready witness

THAT NO topheavy system should be constructed around the enforcement of the water-power act was the general tenor of testimony given on Wednesday of this week by Ray Lyman Wilbur, Secretary of the Interior and acting chairman of the Federal Power Commission, before the interstate commerce committee headed by Senator Couzens. Mr. Wilbur favored the appointment of full-time commissioners but stuck to the original intent of the law that the work should continue under a small co-ordinating agency drawing on the three executive departments for most of its engineering and accounting services.

With many a picturesque phrase, the tall Westerner quietly but thoroughly illuminated the broader aspects of the Federal Power situation. Although he was careful to show no personal bias toward any member of the commission staff, it was apparent that his reaction was more in line with the views of Mr. Bonner than with those of Accountant King and Solicitor Russell. Internal dissension rather than lack of men has been a main reason for the delay in accounting, Mr. Wilbur believes. Asked why he did not remedy the situation by changes in personnel, he said that action before the Senate finishes its inquiry would make martyrs of the losing side.

Senator Couzens read letters to show that departmental field forces have been unwilling and inadequate to check project expenses. Secretary Wilbur admitted that he has encountered difficulties in getting over the idea, but said that a good co-operative system is being developed with active support assured. The Secretary was inclined to minimize the importance of past delays inasmuch as "backtracking" can be done once the commission starts to function smoothly. Already, he declared, the work has been expedited, with the result that four accounts on which pre-license claims are questioned now are almost ready for hearings. These concern the Niagara Falls Power Company, the Empire District Electric Company (Missouri), the Lexington Water Power Company (South Carolina) and the Columbus Electric Company (Georgia).

Participation of Cabinet officers in the World Power Conference was characterized as "window dressing" to extend government support to a legitimate international body. The motives behind this action, he asserted, should not be suspected because O. C. Merrill had accepted travel money for promotion of the conference while still executive secretary of the Power Commission.

Drawn out on the Boulder Dam issue by Senator Pittman of Nevada, Secretary Wilbur said: "I consider myself as a trustee of an investment fund. I must spend $165,000,000 and get it back in fifty years at 4 per cent. Theory aside, it is a business proposition which I am trying to settle to the best interests of the public." He explained his tentative power allocation as the practical way of finding a market without jeopardizing state or municipal interests while the project is getting on its feet.

Concerning the Flathead project, Mr. Wilbur upset some of Senator Wheeler's contentions by showing how thoroughly he had considered all sides of the case. Niagara also was touched upon, but the Secretary declined to discuss fine points of law which he said he had heard interpreted twenty ways.

For a half-hour prior to the end of Wednesday's session, which closed the hearings on the Couzens reorganization bill, James F. Lawson, acting chief counsel for the commission, read a

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WHENCE ARTIFICIAL LIGHTNING SPRANG

In this shack Charles P. Steinmetz first conceived the idea of generating "artificial lightning." It was his favorite play spot and has just been given to Henry Ford for his museum. Erected originally by the great General Electric Company engineer on the Mohawk in New York, it will be re-erected on the River Rouge in Michigan.

statement prepared from the legal point of approach. Mr. Lawson spoke for a larger permanent staff. He pointed out that one of the chief troubles has been the rapid turnover in personnel both with the Secretary-Commissioners and the army aides who are placed on short assignments and transferred to other duty before they thoroughly learn their jobs. In general, he seemed to side with the King-Russell side of the argument from an independent viewpoint.

No further hearings will be held till the committee decides its course of action. Probably an amended reorganization bill soon will be reported. This is generally conceded some chance of passage, but the broader control legislation toward which the committee is headed seems unlikely of adoption. A series of hearings are expected on the entire interstate power problem. The Niagara Falls Power Company and others probably will have a chance to present their case in connection with the broader inquiry.

•

Trade Commission Still Occupied with A. G. & E. Set-up

THE MILLS of the gods continued to grind through the week at the Federal Trade Commission offices, with John H. Bickley, government accountant and investigator, as the principal witness. The commission has nearly completed the introduction of its evidence regarding the corporate relationships and transactions of the American Gas & Electric Company and its subsidiaries. Probably by the time this appears the company officers will have begun to present their side of the case. A detailed analysis of the voluminous figures and records presented must await this further testimony.

So far, the outstanding development is Commissioner McCulloch's decision to investigate not only the interstate elements of the company's holdings but even the subsidiaries whose power sales are entirely intrastate. This ruling was made over the protest of Louis Connick, company counsel, when records of the Scranton Electric Company were introduced on Wednesday, March 5.

The growth of the Scranton company and also of the Ohio Power Company and others was described by Mr. Bickley, whose accounting methods were attacked by H. D. Anderson, secretary of the American Gas & Electric.

Ernest R. Lucas, another commission accountant, described the formation of the Indiana & Michigan Electric Company from smaller units. Its fixed capital grew from $9,062,000 in 1916 to $31,021,000 at the end of 1928. Max F. Millikan, vice-president and counsel for the A.G.&E., told how he had acted as an intermediary in transferring the assets of the Electric Company of America to the former. This was a "rubber-stamp" arrangement, he testified, to avoid formalities which would have caused trouble and delay.

•

Boulder Dam and Muscle Shoals

CONTRACT forms for the leasing of power from the Boulder Dam project have been sent out by the Interior Department to parties interested in entering an agreement, according to reports at Washington. Secretary Wilbur's office, as this is being written, neither verifies nor denies the reports. It is known, however, that the solicitor's office of the Interior Department has been working on the legal phases of the contracts for some weeks.

In the Muscle Shoals hearings during the past week William B. Bell, president of the American Cyanamid Company, was the central figure in promoting his bid for the Shoals and in explaining lobbying activities accompanying that bid. Committee questioning sought to lead Mr. Bell into the contradiction that, on one hand, power could not be marketed in the region and, on the other, that the government should greatly increase the power output by building Cove Creek Dam and Dam No. 3. The witness stuck to his point that the building up of a chemical industry is the only use of the Shoals energy now wasted which gives immediate promise.

Soon the military affairs committee plans to receive testimony on the Hogg, Langley, and Almon bills now pending before the House. The latter embodies the Norris bill with the Black amendment—leasing with government operation as an alternate—which is expected to come before the Senate, with favorable chances, about March 15—that is, soon after the tariff bill is settled.

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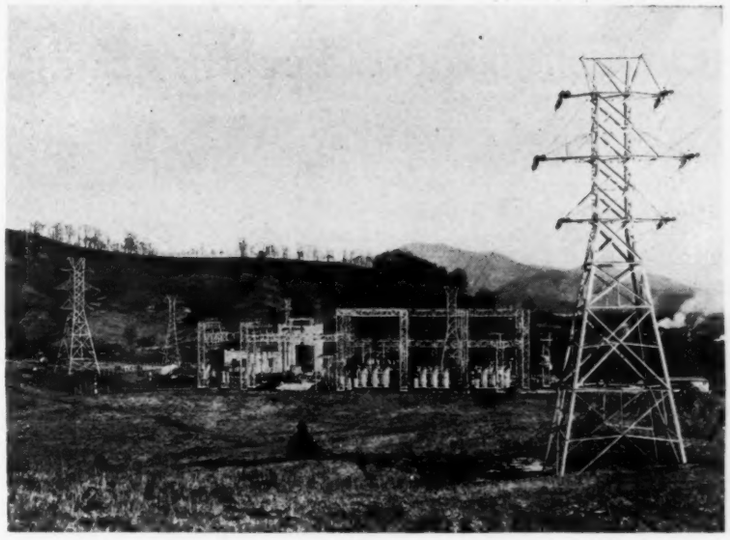
INTERCONNECTION IN SOUTHEAST GOES ON



Shown here is the new substation of the Carolina Power & Light Company at Canton, N. C. From it there runs to Greenville, S. C., a 50-mile, 110-kv. transmission line which interconnects with the system of the Duke Power Company.

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Senator Wheeler Unmasks World Power Conference

DECLARING that "unless things now existing in the Federal Power Commission are stopped the scandal of this administration will be water power," and that Secretary Bonner's resignation should be demanded, Senator Wheeler of Montana on Tuesday denounced the American Committee of the World Power Conference as controlled by the "Power Trust." Electric utility leaders, he said, "were glad to put up their money" for that committee's expenses when they saw Mr. Hoover's name as the original honorary chairman.

Sinister actions and purposes, exemplified by the appointment of O. C. Merrill, former executive secretary of the Federal Power Commission, as chairman, were attributed by Mr. Wheeler to this American committee, and he demanded the resignation from it of Secretary of Commerce Lamont, now honorary chairman, and the three members of the Federal Power Commission, honorary vice-chairmen.

Head of New York Inquiry on Regulation Calls Report "Epoch-Making"

SEVENTEEN specific recommendations are contained in the report of the Knight legislative commission relating to revision of the New York Public Service Commission law, which was submitted to the Legislature at Albany this week. Its provisions, of which the commission's own summary is printed below, follow largely the implied suggestions of the report of William J. Donovan, the legislative commission's counsel, which was summarized last week.

The most important point of difference between this majority report and the minority report, also summarized last week, is in the establishment of the rate base. Professor J. C. Bonbright, indorsed by the other minority members (the governor's appointees), proposes that the base value for rate-making purposes shall be determined by a legislative mandate for all utilities in the state, excepting steam and street railways. By his plan an initial valuation would be made of all properties as of the date of the adoption of the act, taking into account actual cost, reproduction cost, general expenditures, depreciation, going value and all other relevant factors. Such initial valuations when once determined would remain unchanged, but to them would be added the amounts of actual and reasonable cost of new properties, thus enabling the Public Service Commission to have always available, through accounting control, the total rate base.

Commenting on this plan, the Knight report says: "However sound from the economic point of view the fixation of values of existing properties from this time forth may be, and, therefore, however right and just the provisions of this bill may be, the acceptance of its provisions either by the Legislature or the Supreme Court must depend upon a preliminary period of education. It is believed that recommendations of this sort from the legislative commission must be made, not with reference to what is perhaps ideal and desirable, but rather with reference to what is desirable and at the same time feasible and expedient. In our judgment there can be no such drastic break with the past as is proposed without a series of intermediate steps, which grow out of a new public policy shaped up under more or less persistent educational efforts."

Two points of disagreement between the majority and minority are (1) that in the matter of valuation the plan of the minority, as just explained, would be mandatory and perpetual, while that of the majority would be voluntary agreement between the utility and the state commission under authority of the Legislature and for a limited period, and (2) that the minority urge appointment of a people's counsel by the Governor, the majority by the Attorney-General—a divergence due obviously to politics.

Two other major recommendations contained in the Knight report are (1) that the authority of the Public Service Commission be extended so as to enable it to obtain complete information regarding the identity of stockholders of utility corporations and transactions between utility corporations, holding companies, affiliated service agencies and other affiliated interests, and (2) that the authority of the commission with respect to accounting control, security authorizations, reorganizations, mergers, transfers of franchises or property and acquisition of stock of utility corporations be strengthened and extended.

In relation to the vexatious subject of rate of return the commission recom-

Summary of Legislative Commission's Recommendations

1. That a valuation be made of all public utilities in the state except steam railways and street railways.

2. That the Public Service Commission be authorized to enter into contracts with utility corporations for stabilization of valuation and regulation through accounting control for a period not exceeding ten years.

3. That the authority of the commission be extended so as to enable it to secure complete information regarding the identity of stockholders of utility corporations and transactions between utility corporations, holding companies, affiliated service agencies and other affiliated interests.

4. That the authority of the commission with respect to accounting control, security authorizations, reorganizations, mergers, transfers of franchises or property and acquisitions of stock of utility corporations be strengthened and extended.

5. That a reasonable procedure be established for the recovery of reparations in cases where rates have been declared unreasonable or unjust.

6. That submetering companies be prohibited from charging more than the filed rates of the companies from which they purchase current and that they be subjected to the limited jurisdiction of the Public Service Commission.

7. That a commission be established to study and report upon interstate problems affecting regulation, including the feasibility of action with neighboring states through compacts.

[Recommendations Nos. 8 and 9 refer to small non-electrical utilities and to grade-crossing elimination respectively.]

10. That a division of rural electrification be established in the Public Service Commission to study and promote the development of rural electrification on an area plan.

11. That a bureau of research and valuation be established in the Public Service Commission with its principal task that of intensive studies of cost accounting, cost of service and rate structures.

12. That public utility corporations be required to give notice of proposed changes of rates by public advertisement and by notice to consumers with their bills.

13. That the office of people's counsel be created in the Department of Law, to be filled through appointment by the Attorney General, with the duty of representing the people and co-operating with the representatives of municipalities and consumers in proceedings before the Public Service Commission and in the courts.

14. That appropriate legislation be passed to enable the state to take advantage of the provisions of Section 266 of the Federal Judicial Code providing for the observance of the principles of comity by the federal courts.

15. That the Legislature urge upon Congress the revision of the Federal Judicial Code so as to make it possible for state courts to make primary determinations in rate cases prior to appeal to the federal courts.

16. That the staff of the Public Service Commission be increased and that additional appropriations be made to enable the Public Service Commission to carry out these recommendations.

17. That the testimony presented to us regarding the coal freight charged by the electric companies in New York, the alleged deterioration in the quality of gas furnished in New York City, the expenditures of the gas and electric companies in New York City in connection with the adjustment of franchise taxes, and the service of the International Railway Company of Buffalo, be called to the attention of the appropriate state authorities for such action as may be required.

Other amendments of secondary importance have been approved by the legislative commission of investigation and will be submitted soon in the form of bills to the Legislature.

mends: (1) that in the case of a contract a rate of return on the initial valuation shall be agreed upon by the Public Service Commission and the companies concerned; (2) that for future investments the rate shall be fixed for bonds and preferred stocks at the market price received from the purchaser, and that for common stocks the Public Service Commission and the companies shall agree upon a reasonable rate of return necessary to attract new capital, with proper allowance for amortization of discount and premiums; (3) that the commission shall use this method, so far as possible, as a guide for determining rates of return for companies which do not enter into a contract.

Senator Knight issued a statement in which, after accusing the Governor and the minority commissioners of a "tendency to brush aside the fundamental law of the land as immaterial and unimportant," and the Governor of a "purpose to tear down and to condemn," he summarizes the provisions alluded to already and concludes:

"These recommendations, with provisions for the complete reorganization of the commission, including the creation of a research and valuation bureau, are the principal features of a report which I consider epoch-making."

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San Francisco Votes on Condemnation in August

OPPORTUNITY will be given to San Francisco voters on August 26, the date of the primary election in California, to decide on the question of issuing bonds to acquire the local distribution systems of the Pacific Gas & Electric Company and the Great Western Power Company to be used to distribute the power developed by the Moccasin plant of the Hetch Hetchy municipal project. This decision of the Board of Supervisors to place the question on the ballot at the state primary election puts an end to agitation for a special election.

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Roosevelt Repeats Views; Maltbie Heads Board

SPEAKING before the National Democratic Club on March 1, Governor Franklin D. Roosevelt of New York reiterated in the clearest language his stand on the regulation of public utilities. The Governor said:

My esteemed friend who stepped out of the chairmanship of the Public Service Commission yesterday in a speech in Albany the other day said that it was the function of the Public Service Commission to sit up on a bench and hand out justice on the one side to the people of the state and on the other side to the utilities; in other words, a sort of an arbiter between two contesting forces.

Historically, practically, legally and in every other way, Mr. Prendergast was dead wrong. The Public Service Commission is not a quasi-judicial body. The Public Service Commission is the representative of the Legislature, and, back of the Legislature, of the people. It is not dealing between two contestants. It is representing one side, the people of the state, definitely and clearly. And it has one function, not a function to choose between the people and the public utilities, but the sole function, as the representative of the people of this state, to see to it that the utilities do two things: First, give service, and second, charge a reasonable rate.

That's the law and the prophecy on public service company regulation in the State of New York. I am perfectly sure it is the law, personally, and I am willing to guess that the prophecy part of it is true too.

—*Wide World Photos*

Milo R. Maltbie

Seeking to head the commission a man who will represent this view—of interest to utility companies in every state where there is or may be a regulatory commission—the Governor has selected for the unexpired period of Mr. Prendergast's term Milo R. Maltbie of New York City. Mr. Maltbie, who is nationally known as a public utility expert, was appointed in 1907 by former Governor Charles E. Hughes to membership on one of the two original public service commissions of his state and served eight years, being regarded in that capacity as a "liberal" rather than a "radical."

Mr. Maltbie was a member of the advisory board on railroad valuation of the Interstate Commerce Commission from 1915 to 1916. He was Chamberlain of the city of New York in 1916-1918 and has been a consultant and expert on public utilities since 1915. In 1906 he conducted an investigation in Great Britain into the relative merits of municipal and private management of public utilities. He was born in Hinckley, Ill., in 1871.

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"Strengthen State Regulation," Say Bay State Legislative Inquirers

SIMULTANEOUS protection of the public interest and allowance of the greatest possible freedom to private enterprise and initiative are declared to be the purpose of the special commission on the control and conduct of public utilities whose report to the Massachusetts Legislature was made public on Monday of this week by its chairman, Senator Frank W. Osborne of Lynn. In view of the growth and centralization of the power industry in the past quarter-century, and in particular the rise of the holding company, the commission believes that the present laws should be adapted to meet the new conditions and that fundamental changes in the statutes are necessary.

Ten bills have been drawn up embodying about a dozen principal recommendations designed to strengthen the regulatory and publicity powers of the Department of Public Utilities, and the most important of these have to do with holding-company management and intercompany and interstate power contracts. Direct regulation of holding companies either by the state or by the federal government is declared to be unnecessary at this time; the regulation of operating company rates is asserted to be the major problem in industry supervision by the public authorities, and in straightforward terms the commission points out that the people of the Bay State give small sign of leaning in any real numbers toward government ownership as a means of solving questions which have arisen during the rapid and enormous development of the power industry.

The gist of the legislation recommended by the commission is as follows:

1. That holding company securities be brought under the so-called "blue-sky" law. The resulting publicity will aid investors.

2. Give the Department of Public Utilities full power to ascertain relations between holding companies and subsidiaries.
3. Require annual returns of operating companies to include full details of holding-company supervision costs and practices.
4. Give the Utilities Department supervision over all contracts for the purchase of electricity or gas for terms exceeding one year. Three years is now the minimum for electric contracts.
5. Grant the department power to regulate contracts for holding-company services either through approval when made or by review in rate cases.
6. The department should, in the public interest, have power to order a wholesaling company to supply another electric utility at fair rates.
7. A company selling electricity in bulk only should be required to file copies of its contracts with the department.
8. Federal regulation is not now necessary, and the states may well proceed toward the establishment of a co-operative basis of interstate power regulation, subject to congressional approval as to mechanism.
9. In acquiring a gas or electric system a municipality should not be required to take over any part of the private company's local property not used for the service of customers within the city or town concerned. Nor should it be required to buy both gas and electric plants in taking over either, unless so ordered by the Department of Public Utilities. The department should determine the property to be taken over and also the price to be paid, the decision being final except in cases where the department acts in bad faith.
10. Sale of a municipal plant to a private company should require approval by the department to become valid.
11. The annual orders, reports and decisions of the department should be published.
12. Salaries of the department commissioners should be on a plane comparable with that of the judges of the Superior Court.

In an exhaustive survey of conditions within the state the special commission finds that seven great systems of electric company service now furnish 90.5 per cent of the total kilowatt-hours consumed. These are the Boston Edison, New England Power Association, Western Massachusetts Companies, Tenney companies, Massachusetts Utilities Associates, Associated Gas & Electric System and Stone & Webster properties. Eight other private companies do 3.8 per cent of the retail business and 43 municipal electric plants do 5.7 per cent.

The commission is convinced that the managements of both private and public systems are rendering excellent service and that one supplies a desirable check upon the other, although the report states that detailed comparisons are most difficult. The report vigorously discusses the need of full publicity as to holding-company matters as a corrective of possible abuses. It maintains that the present situation requires no federal interference.

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Bare Neutral Wiring Permitted in Detroit

RULINGS of the Electrical Inspection Bureau of Detroit, Mich., just published and now being distributed, contain two permissions for bare neutral wiring. The first of the two allows the bare wire to be used in service entrances in conduit from the connection drops to the meter. It is asserted that this ruling effects a definite economy in domestic electric range services. The second and more important permission relates to the use of bare neutral throughout the whole installation.

The form of the ruling is such that installations will be made only on written authority from the inspection bureau and under its supervision. The purpose of these restrictions is to confine the number of installations to proportions that can easily be observed and kept track of so that the bureau may make records of performance to determine whether or not the permission may later be enlarged to general application.

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Eugene (Ore.) Extension Not Territory Invasion

THROUGH C. A. McClain, general superintendent - secretary of the Eugene (Ore.) Water Board, comes a denial of the statement made in the ELECTRICAL WORLD of February 15 that in preparing to serve a paper mill outside the city limits Eugene contemplates invading the territory of the Mountain States Power Company.

Mr. McClain says (1) that the company long ago agreed with the city to furnish no service of the type mentioned within a mile of the city limits and that the mill site touches if it does not impinge upon the boundary, (2) that the company did not serve that immediate neighborhood at the time it sold its system to the city fourteen years ago, (3) that the company has no lines within four miles of this site, and (4) that the policy of the city board has been to serve such outlying territory as can be economically served from the city lines and has no other means of receiving service and that this policy has benefited many districts.

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Engineering Progress Interests New Englanders

KEEN interest in engineering progress was evinced by about 300 members of the Engineering Section of the New England Division of the N.E.L.A., who met at Boston on February 27 and 28 and listened to a program covering improvements in apparatus in various fields and including a lecture by W. S. Murray on the Saluda River development in South Carolina and a paper by C. R. Oliver on the 220-kv. line from the New England Power Association's Fifteen-Mile Falls development. H. A. Stanley, vice-president Fall River Electric Light Company, discussed overhead versus underground costs. Extracts from the proceedings will later be treated topically.

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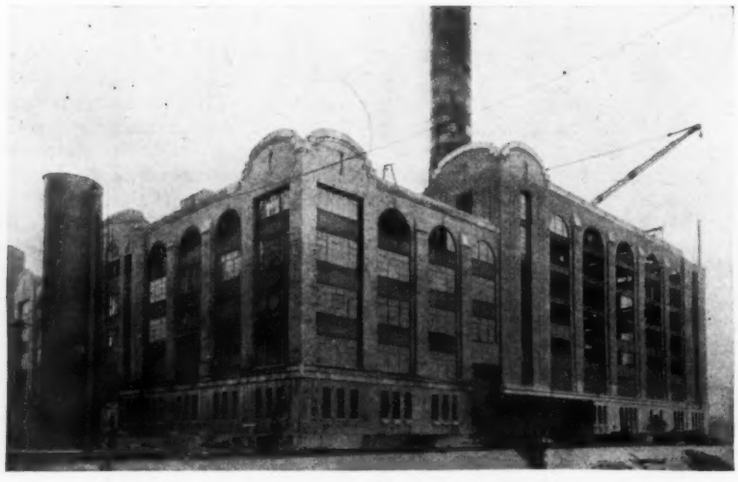
STILL MORE ENERGY FOR PITTSBURGH



The James H. Reed station of the Duquesne Light Company is moving rapidly along to completion. It is adjacent to the Brunot Island plant of the company and will contain two 60,000-kw. units, one of which is expected to be in operation about August 1.

Plants Building or Contemplated in Many States

AUTHORITY has been given to the Stone & Webster Engineering Corporation by the Potomac Electric Power Company to proceed with the design and construction of an extension to the Washington utility's Bennings station. It will cost about $3,000,000 and include an addition to the building and the installation of a 30,000-kw. turbo-generator.

Completion of the hydro-electric project near Altmar, N. Y., for the Niagara, Lockport & Ontario Power Company is near. The dam is 570 ft. long, 44 ft. thick at the base and 58 ft. high. At the south end of the dam and forming a part of it, a concrete power house will contain two generators of 7,000 hp. each. Provision is made for a third unit of like size. This project is the second in a series of developments on the Salmon River which will form one of the major hydro units of the Niagara-Hudson system.

The West Virginia Power Company has received permission from the West Virginia Public Service Commission to reinstate its application for authority to construct a water-power dam 14,000 ft. below the mouth of the Bluestone River. The dam would develop approximately 84,000 hp.

Construction of a 66,000-volt power line between Hutchinson and McPherson, Kan., to be built by the North American Light & Power Company, will start soon.

November 1 has been set as the date for completion of the five-million-dollar hydro-electric project of the Missouri Electric Power Company on the Niangua River. This stream is being diverted through a 1,000-ft. tunnel to take advantage of a 23-ft. fall. The plant will serve south-central Missouri towns.

The Virginia Public Service Company plans to start construction this spring on a steam station on the James River near Bremo, Va. The initial installation will be two 15,000-kw. units; the ultimate capacity will be 100,000 kw. This station will be connected with the transmission system of the company by a double-circuit line from Bremo to Charlottesville.

As a result of a disagreement between city officials and the Georgia Power Company, the Rome (Ga.) City Commission has voted to construct a municipal electric and power plant and a committee has been appointed to arrange details.

Contract has been let for a 15,000-kw. addition to the Weleetka generating station of the Public Service Company of Oklahoma. This will bring the rating of that station to 30,000 kw. and of the company to 75,000 kw.

The Central Power & Light Company's new 87-mile, 66,000-volt transmission line, running north from Uvalde, Tex., to the north line of Edwards County, is ready for service. At the county boundary the line interconnects with the West Texas Utility Company's transmission system, and it is possible therefore to give service to all points on the line from both directions. Voltage can be doubled.

A new 20,000-hp. steam-electric generating plant for the Central Power & Light Company is nearing completion near Del Rio, Tex., on the east bank of Devil's River. It is equipped with two 7,500-kw. units.

A temporary state permit allowing two years to complete investigation before commencing construction has been issued to the Yakima-Klickitat Power Company for a proposed hydro-electric project on the Klickitat River in Washington State, to cost $1,500,000. A diversion dam 20 ft. high and 150 ft. long would be built in Yakima County near the base of Mount Adams, and canals and flumes would carry the water 9½ miles southeastward to the power plant in northern Klickitat County, where a fall of 600 ft. would be utilized to develop 23,865 theoretical horsepower.

Rapid progress is reported by the Pacific Gas & Electric Company on reconstruction work in Placer County, Calif. The entire project calls for an expenditure of $1,090,000, the major portion of which will be used on canal and tunnel work.

New Hampshire Ponders Revising Utility Taxes

TAXATION was the sole subject before a special session of the New Hampshire Legislature called by Governor Tobey. One bill submitted provides that the tangible property of gas and electric utilities should be taxed locally and the taxes retained by the town, the franchise being taxed by the state and turned into an equalization fund. It is estimated that this would bring the state a revenue of about $350,000, increasing with development.

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Framingham Linemen Are Feted on Safety Record

THIRTY-FIVE men composing the line maintenance force of the Edison Electric Illuminating Company of Boston in the Framingham (Mass.) district have just completed four and a half years without a single "lost-time" accident. Appropriate recognition of this achievement was rendered the crew last week at a dinner attended by various company executives. The territory covered by the crew includes a western suburban area traversed by circuits of 110 kv. and lower, and virtually every branch of overhead line work is handled in it.

The entire force of 3,600 employees passed the month of February, 1930, without a "lost-time" accident.

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ILLUMINATING A MAHARAJA'S PALACE

—Press Photo Bureau, Madras.

Spectacular lighting appeals to the Orient, too. On a recent festival occasion the Maharaja of Mysore had his palace illuminated in a way to dazzle his subjects.

Is Kentucky's Action on Cumberland Site Final?

QUESTIONS connected with the Insull proposal to build a hydro-electric plant at Cumberland Falls, Ky., on the one hand, and with former Senator du Pont's offer to establish a state park there, on the other, may have been finally settled, and the matter thereby taken out of the hands of the Federal Power Commission, before which it has been for many months a much controverted issue, by the vote of the Kentucky Senate to accept Mr. du Pont's proposal. Its acceptance by the House of Representatives, by 63 to 30, was reported last week. The Senate vote was 21 to 16. Governor Sampson, who favors the power development, may veto the bill, but, Louisville advices say, the situation—into which party politics enters—is such that it would undoubtedly be passed again over his veto.

It is asserted that the people of the district containing the falls are not impressed by the arguments of the scenery conservationists and would welcome the industrial development that would follow utilization of the latent water power, and there is talk of contesting the legislation as involving an unconstitutional use of the state's power of condemning land, since the site is now owned by the Cumberland River Power Company and its acquirement by the state at the expense of a private person would be unusual. But, barring court interference or a speedy repeal of the act, the advocates of a scenic resort as against a hydro-electric plant have apparently won.

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North Central Men Get Encouraging Report

BETWEEN $25,000,000 and $30,000,000 will be spent for improvements and extensions in electrical equipment and service in Minnesota and North and South Dakota during the present year, John Lapham, secretary of the North Central Electric Association, told 250 members of the Engineering Section in attendance at their two-day annual meeting in Minneapolis. The sessions were held on February 24 and 25. Mr. Lapham pointed out that rate reductions put into effect by power companies in the three states mentioned have benefited 80 per cent of the consumers.

President T. T. Parker of the association, J. M. Bryant, head of the department of electrical engineering, University of Minnesota; A. D. Bailey, W. J. Sorenson, Frank F. Fowle and others spoke on a variety of engineering and cognate topics.

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Harvard Business School Makes Advertising Awards

WINNERS of the 1929 Bok advertising awards, comprising a gold medal and nine cash prizes aggregating $14,000, have been announced by the Harvard Graduate School of Business Administration. The gold medal went to Cyrus H. K. Curtis, head of the Curtis Publishing Company.

Among the other awards for advertising "conspicuous for excellence of planning and execution," one of $2,000, for a "local campaign for a specific product or merchandise," went to the Northern States Power Company for a campaign in Minneapolis which embraced a series of eight newspaper advertisements proclaiming the benefits of low-cost electricity in the home and featuring how much electric service can be purchased for one cent. This series was part of the company's general program of advertising—one of several years' standing—explaining its domestic rate structures to customers.

Another award, also $2,000, for a "general or institutional campaign," was won by the Westinghouse Electric & Manufacturing Company for a campaign made through leading American newspapers, mainly in their rotogravure sections. These advertisements are shown in miniature on this page.

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Arizona Still Means to Fight in Supreme Court

DESPITE the optimistic view of the Boulder Dam situation taken at Washington, Governor John C. Phillips of Arizona declared last week, in his first public statement since the recent inconclusive lower-basin state conference at Phoenix, that Arizona will file suit in the United States Supreme Court to prevent construction of the dam "whenever Secretary of the Interior Wilbur lets construction contracts." It is expected that the suit will be in the form of a petition for an injunction.

Governor Phillips said that it is his interpretation of the Swing-Johnson Boulder Dam bill that Congress cannot make an appropriation for construction of the dam until there is a seven-state agreement as to allocation of water and power. This agreement, he said, can never be reached until Arizona and California compose their differences.

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WESTINGHOUSE WINS A BOK AWARD

J. C. McQuiston, general advertising manager for Westinghouse, "points with pride" to the prize-winning exhibit in the presence of (left to right) A. L. Billingsley, president of Fuller & Smith, the Westinghouse advertising agency; E. K. Emerson, of the same firm, and R. R. Davis, editor-in-chief of Westinghouse advertising.

Coming Meetings

Oklahoma Utilities Association — New Tulsa Hotel, Tulsa, March 11-13. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

Northwest Electric Light and Power Association — Accounting Section, Portland, March 17-18; Engineering Section, Hotel Morck, Aberdeen, Wash., March 26-28. B. Snow, 1206 Spalding Bldg., Portland, Ore.

Illinois State Electrical Association—Hotel Abraham Lincoln, Springfield, March 19-20. George Schwaner, 205 Illinois Mine Workers' Building, Springfield.

Pacific Coast Electrical Association—Commercial Section, Fresno, Calif., March 20-21. G. T. Bigelow, Southern Sierras Power Co., Riverside, Calif.

Southeastern Division, N.E.L.A.—Bon Air-Vanderbilt Hotel, Augusta, Ga. April 15-17. C. M. Kilian, 207 Bona Allen Bldg., Atlanta, Ga.

Middle West Division, N.E.L.A.—Fort Des Moines Hotel, Des Moines, Iowa, April 23-25. Thorne Browne, 1527 Sharp Bldg., Lincoln, Neb.

Missouri Association of Public Utilities—Springfield, Mo., May 1-3. F. D. Beardslee, 315 North Twelfth St., St. Louis.

Southwestern Division, N.E.L.A.—Hot Springs, Ark., May 6-9. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

American Institute of Electrical Engineers—District meeting, Springfield, Mass., May 7-10; summer convention, Toronto, June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Manufacturers' Association — The Homestead, Hot Springs, Va., May 18-23. E. H. Hubert, 420 Lexington Avenue, New York.

East Central Division, N.E.L.A.—Hotel Statler, Cleveland, May 20-23. D. L. Gaskill, Greenville, Ohio.

American Electrochemical Society — St. Louis, May 29-31. C. G. Fink, Columbia University, New York.

North Central Division, N.E.L.A.—Managerial Section, Alex. Johnson Hotel, Rapid City, S. D., June 11-12. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Canadian Electrical Association—Manor Richelieu, Murray Bay, Que., June 11-13. H. M. Lyster, 405 Power Bldg., Montreal.

Pacific Coast Division, N.E.L.A.—San Francisco, June 16-20. S. H. Taylor, 447 Sutter St., San Francisco.

National Electric Light Association—San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.

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Long Beach Unit No. 11 Goes Into Service

HAVING passed all its initial tests satisfactorily, unit No. 11 of the Southern California Edison Company's Long Beach steam station was placed on the company lines on February 23, picking up a load of 20,000 kw. in fifteen minutes. This was increased after five hours' operation to 40,000 kw., operation continuing at this value for an additional five hours. The unit was then declared ready for continuous service on or before the first day of the following month.

Unit No. 11 is a duplicate in all its major features of unit No. 10 of the same plant, the only noteworthy change in design being in the steam superheaters, which for the new unit are of single-pass design instead of three-pass as in unit No. 10. It has increased the capacity of the Long Beach steam station to 415,000 kw. and the steam generating capacity of the Southern California Edison Company to 461,000 kw.

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California and Oregon Projects Seek Permits

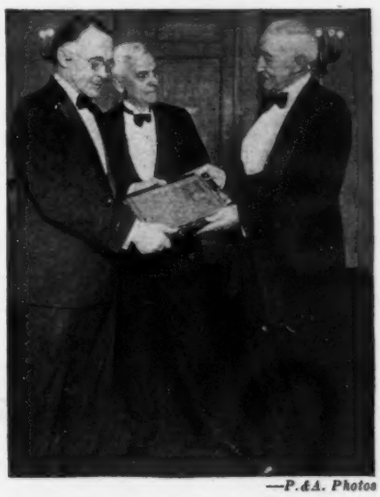
APPLICATION for a preliminary permit covering a project on Bear River, Cold Creek and the North Fork of the Mokelumne River in Amador County, Calif., has been made to the Federal Power Commission by the Pacific Gas & Electric Company of San Francisco. The proposed development includes a concrete arch dam 220 ft. high in Bear River, forming a reservoir with a capacity of 50,000 acre-feet; a conduit extending from the dam to a proposed power house near the applicant's Salt Spring dam, and a conduit 4,000 ft. long diverting water from Cold Creek to the foregoing conduit. The primary power to be made available is estimated at 17,000 hp. It is planned to install 34,000 hp.

Wallace Huntington of Portland, Ore., has applied for a preliminary permit covering a project on the McKenzie River in Linn County, Ore. It is proposed to construct a dam at the outlet of Clear Lake. From that point it is to be conducted 3,500 ft. by a conduit to power house No. 1. Below this power house a second dam will be constructed from which a conduit one-half mile in length will extend to power house No. 2. In like manner two other dams and power houses will be erected at points further down the stream. It is planned to install 44,500 hp. to be used for public utility purposes.

Licenses for transmission lines have been requested by the Washington Water Power Company, from Spokane to Kellogg, 65 miles; by the California-Oregon Power Company, from Dixonville to Marshfield, 64 miles, and by half a dozen utilities for shorter lines in various regions.

The Arizona Water Conservation District of Wittmann has applied to the commission for a preliminary permit covering a power development in connection with its irrigation project. The plan includes a power house at the Walnut Grove dam, a power house at the Van Buren dam, a third power house at Fools' Canyon and a fourth power house on the Hassayampa River below Wickenburg. It is planned to install 10,000 hp., to be used for mining and general commercial purposes.

WASHINGTON AWARD TO DEAN COOLEY



—P.&A. Photos

An eloquent plea for the broadening of engineering education along humanistic lines was made by Dean Mortimer E. Cooley of Michigan University in accepting last week at the hands of W. S. Monroe, president Western Society of Engineers, the Washington award of that society for 1930. C. B. Burdick, chairman of the commission of award, looks on.

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Indiana Men Debate Uniform Rate Idea

ABOLITION of all regard to local autonomy in rate making will be effective if the pending big Insull gas and electric merger is approved by the Indiana Public Service Commission, according to testimony given by L. B. Andrus, vice-president of the Central Indiana Power Company, at a special hearing last week. Under the Insull plan, as outlined by him, all towns and cities of the same classification and served from the same power or gas pool must pay similar rates. No rate change could be made upon petition of a single community without revaluation of all properties included in the pool.

In the opinion of Harvey Harman, former utility commissioner and chief counsel for the opposition, this system of rate making will leave local communities and citizens almost wholly without relief except by an expensive and round-about process. Mr. Harman admitted, however, that the idea formed the best method of avoiding discrimination between communities in the matter of electric costs.

Resumption of regular hearings on the merger has been set by the commission for March 17.

SCENERY + SALMON + POWER +

When the 3,500-ft. dam across the Columbia River near Wenatchee, Wash., is completed that famous stream will offer its first major power development. The Puget Sound Power & Light Company plans to start work at once on the initial 80,000-hp. unit of an ultimate 240,000 hp. capacity

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EDITORIALS

L.W.W. MORROW
Editor

Wage Incentive Plan for Utilities?

INDUSTRY has found the wage incentive plan an excellent tool to improve management. It is possible that utilities might use the plan to get better results from their operations. One industrial plant applied the wage incentive plan to its power-plant operations. In three years the number of employees was reduced from 125 to 93, the cost of power by 3.5 mills a kilowatt-hour, the maintenance charges 15 per cent, with large increases in the steam and energy output per employee.

Wage incentive plans are based on sound business principles. They aid management and help efficient workers. Since they have been so effective in industrial establishments, they should be used in utility operations or at least studied seriously. There is little doubt that they increase the efficiency of normal operations and reduce maintenance charges very greatly.

Suggestions for Better Regulation

IN NEW YORK and Massachusetts legislative commissions have investigated state public utility regulation and have made recommendations to their respective legislatures. As part of the general situation these reports are interesting and suggestive.

In Massachusetts the report states that the vital addition needed to regulation as it is now practiced is to give the commission power over all contracts between utilities and require these contracts to be filed. This suggestion is reasonable and would go far to dispose of the problem of holding-company management, construction and financing fees.

In New York the legislative commission makes seventeen recommendations for changes. This report is a mixture of politics and economics, and to it is appended a very radical minority report written by the three committee members appointed by Governor Roosevelt.

The chief suggestions of the majority are:

1. That a valuation shall be made of all utilities by the commission.
2. That this valuation shall be used as the basis of a ten-year contract between the utilities and the commission that will fix rates.
3. That the commission shall have power to establish the identity of all utility stockholders and have control of mergers, security issues, purchases and contracts.
4. That the Attorney-General of the state shall appoint a "public defender" to appear before the commission in rate cases.
5. That a commission be appointed to study the possibility of interstate compacts to deal with interstate business.
6. That to state courts be given the task of making primary determination in rate cases before appeal is taken to federal courts.

Some of these recommendations are sound. Others will fail to accomplish what is desired.

Valuation by itemized inventories is difficult to make and is likely to lead to long-drawn-out litigation and great expense. It would take from three to five years and about $15,000,000 to make valuations of New York utilities in the way in which railroad valuations are being made. Then, again, the ten-year contract suggestion is not workable. Contracts "freeze" a situation for all parties concerned, and, with a political background for one party to the contract, there is little doubt that utilities would be reluctant to agree to the procedure, if they agreed at all.

It is reasonable for power to be given to the commission over utility contracts and for it to possess a stricter supervision of purchases, financing and mergers. Nor is there any great objection to the establishment of the identity of all utility stockholders. Even the "public defender" idea has merit. It would shift the political pressure to the Attorney-General and would relieve the commission, in some measure, from acting as prosecutor as well as judge.

On the whole, these legislative commissions have acted intelligently. They went into deep water in their work and dealt with a complicated situation. No doubt legislation will follow. From the standpoint of knowledge and public good, it would be a wise move for sincere utility leaders to show the good and bad aspects of these legislative suggestions and even to suggest more direct and effective alternatives.

Hopeful Move Toward Unity in Standardization

INDUSTRIAL and engineering standardization made one great forward stride when the principal engineering societies in 1918 promoted the American Engineering Standards Committee. A further advance was made when the informality and unofficiality of the initial organization was replaced by the greater degree of confidence and authority reposed in the American Standards Association. Even during this evolution to a greater usefulness several hundred standards have been approved, to the greater economic benefit of industry. Much still remains to be done to perfect the procedure and command the participation and respect of all bodies engaged in production and operation.

One deterrent to maximum co-operation and efficiency is the desire on the part of previously recognized standardizing agencies to relinquish only by degrees their prestige and prominence. It is especially true of the professional engineering societies such as the American Institute of Electrical Engineers, whose standards committee had promulgated many standards. The recent resolution of the A.I.E.E. board assuring co-operation with and participation in a single standardizing agency for the whole electrical industry promises early success of the movement to further the interests of that industry by necessary standardization. It does not seem at all necessary that the Institute shall greatly curtail the activities of its standards committee or suffer loss of prestige by acknowledging the veto power of a more representative commercial and engineering group. Nor does it seem necessary that the interests primarily commercial should not welcome reference to the A.I.E.E. committee of such proposed standards as have a content of strictly professional technical nature closely akin to the existing and respected standards of the Institute.

The encouraging feature of the situation is the imminence of a single standardizing agency speaking for and responsive to the entire electrical industry. Support is being given to such a move by the major interests. The thing that remains to be perfected is the attainment of unity of purpose and function without complete sacrifice of all the virtues of agencies of long-standing and uncommercialized professional prestige. Such a structure can seemingly be simple and direct in its mechanism but still allocate to each participant the responsibility which each by history, experience and inherency is best qualified to administer. Incidentally, the A.I.E.E. standards committee can be useful by instigating discussion of subjects undergoing standardization.

The Stock Dividend Has Its Merits

REFERENCE at the Federal Trade Commission utility hearings to the payment of stock dividends unlooses the usual tirade of misrepresentation and misconception. In the minds of certain factions there is a vague conception that all stock dividends are equivalent to "watering" of stock. The stock dividend, moreover, is sometimes represented as a means of obscuring unduly large earnings.

It is not our contention that the stock dividend has never been abused, but the charge that it *must* give rise to "watered" stock is untrue. If the

cash equivalent of the stock dividend is transferred from surplus to capital account and permanently invested in the business, the stock outstanding is as truly representative of investment as if the stock had been sold by subscription.

A stock dividend cannot conceal unwarranted earnings any more than a cash dividend. On the contrary, the payment of an unusually large stock dividend would be the most conspicuous means of drawing attention to extra earnings.

What is sometimes considered an exorbitant return on common stock may involve no more than the orthodox 8 per cent return allowed on the investment used and useful. For example, a company having an appraised valuation of $1,000,000 may secure this amount by $600,000 in bonds, $200,000 in preferred stock and $200,000 in common stock. If it pays 5 per cent on its bonds and 6 per cent on preferred, or $42,000 on both, an allowed return of 8 per cent on the investment would still leave $38,000 available for dividends on common stock, or 19 per cent.

The stock dividend, properly used, provides a convenient and cheap means of obtaining new capital for expansion or other purposes. Rather than pay out cash to shareholders, the company issues stock dividend certificates with which the stockholder is presumably satisfied and turns over the equivalent amount of cash to the capital account. The unfortunate phase of the situation is that the public has not been thoroughly educated on the merits and real significance of the stock dividend.

Negotiate the Rate-Base Value

WHAT is the fair value of a utility property for rate-making purposes? This is the fundamental question about which centers most of the controversy regarding the adequacy of state regulation. Fixing the rate-base value for a utility is the fundamental and initial step to carry out successfully the present intent and conception of a state public utility commission. This value is not readily determined by legal or economic formulas. It is made up of many elements and is individualistic in character for each property.

Legal and economic formulation have obscured the inherent business nature of the transaction between the user and the seller of the service. Academic concepts of reproduction cost and depreciation lead only to inconclusive litigation and should give way to negotiation between the interests involved. The Supreme Court has not prescribed, and probably never will prescribe, a formula that will meet the individual variations of all cases. The decisions merely pronounce the business principles on which fair values shall be established.

Why not, then, take the court literally and adopt a procedure that will insure the direct negotiation of utility rate bases and returns just as they would be determined by a free purchaser and a free seller? The freezing of values by contractual commitment is not so imperative or promising as the provisions of complete flexibility permitting the state and the utility corporations to agree in open conference on the values needed to insure equity to public user and public investor. The tempo of the electrical industry at the present time is conducive to such a procedure and should be met by a corresponding political attitude of co-operation to make regulation what it was intended to be. The utilities will be willing to go more than half way in negotiating acceptable values. They face a double investment in five to ten years and a difference of a few per cent in present rate-base value will have little or no effect on present rates and is negligible when the future is considered. The commissions in turn have much to gain and nothing to lose by co-operative negotiations.

William J. Donovan, counsel for the New York investigating commission, thus states a vital principle: "No system of regulation of an industry, public utility or otherwise, can possibly succeed if it is simply *imposed* by governmental authority." Successful regulation involves the whole-hearted and voluntary co-operation of utility companies, and, since the alternative to regulation is public ownership, there is every inducement for utilities to play more than fair in dissipating distrust and controversy with regulatory bodies. The first step is to agree upon the fair value of utility properties for rate-making purposes.

Motor Starting Power Factors and Line

By W. B. SHEPPERD

Engineering Department
Century Electric Company, St. Louis, Mo.

Momentary voltage drops due to motor starting are not, in general, lessened by high starting power factors. Suggestion for statement of service rule concerning current limits

HIGH motor starting power factors do not, necessarily, mean lessened line disturbances. In fact, the opposite effect is more frequent. This unexpected result emerges from theoretical study of starting power factors in the usual supply service conditions. It controverts the arguments of advocates of resistance starters and of motors of high inherent starting power factor that, by reason of this attribute, their devices will cause less disturbance than others taking the same current at lower power factors. In the light of present-day efforts to improve power factor by the use of synchronous motors and static condensers the truth of the argument regarding high power factor starting would appear, without investigation, to be self-evident. But appearances, in this case as in many others, are deceptive.

The ill effects of low power factor, from the standpoint of the power company, may be summed up under three heads: Necessity for high generator excitation to maintain full voltage, decrease of kilowatt capacity of generator windings and of lines and transformers, and increase of impedance drop in lines, transformers and generators under some conditions and between certain limits.

The first of these bad effects is of small importance in consideration of the high ratio between unit generator and unit motor sizes on even small systems, of the diversity in time between starting shocks, and of the short time overcapacities of generator fields. The second is not pertinent to discussion of power factor during the starting period, because the thermal capacity of the lines and apparatus is sufficient to absorb the extra energy loss for this short time, and because if ampere loads are set up, as in the N.E.L.A. rules, as the starting limitations, there can be no consideration of power factor at all.

The drop in voltage due to line and transformer impedance drop when a motor is started is the great source of complaint, overshadowing the others. In order to see the effect of power factor upon this impedance drop, three typical resistance-reactance ratios for distribution lines and transformers were chosen, and vector diagrams were made to show the impedance drop produced by a given current at various lagging power factors. The two vector diagrams which are reproduced on the next page show the impedance drop and resultant voltage for zero, 50 per cent, and 80 per cent lagging power factor, for constant current, with two different resistance-reactance ratios. The curves show the impedance drops at power factor from zero lagging to unity for each line or transformer bank considered.

The results shown by the curves may be summarized by the statement that, with a given ampere demand, only on the heaviest lines will a high starting power factor materially reduce line disturbance, while on light lines the advantage will be materially in favor of low power factor. On an average, then, the power factor may be disregarded in formulating rules relating to motor-starting current, and for motor standardization ampere demand at start may be made the sole criterion of probable line disturbance.

Motor-starting rules need change

Certain other elements enter to complicate the motor-starting situation. High power factor is frequently accompanied by high starting torque, and in a small motor with a load of low inertia the starting period may be sufficiently short to minimize the effect of the momentary voltage drop. If, however, the same motor be connected to a flywheel or other high inertia load, the prolonged starting period will allow the full effect of the current to be felt.

Locked Rotor Power Factors of Typical Motors

Power factor at standstill for motors 7½ to 75 hp. will be between the following limits in nearly all cases:

Squirrel cage, normal torque, normal current, 30 to 45 per cent.

Squirrel cage, normal torque, low current, "line start," 35 to 55 per cent.

Squirrel cage, high torque, high reactance, "line start," 45 to 65 per cent.

Squirrel cage, high torque, high resistance, high slip (elevator or machine tool motors), 50 to 80 per cent.

Automatic start, having internal resistance and short-circuiting mechanism acting at fixed speed, 60 to 80 per cent.

Slip ring, starting full load, with reasonable care in operating controller, 65 to 85 per cent.

Disturbances

Three forms of rules are laid down by various power companies to regulate starting of motors across the line. The simplest merely states that a compensator or equivalent device must be used to start any motor above a certain horsepower. The only justification of this rule is simplicity; one motor with a compensator may draw more current than another starting directly on the line. A second form limits starting across the line to motors having starting currents within the N.E.L.A. or some other arbitrary set of limits. This is a practical rule, under average conditions, but is not satisfactory in all cases; the same motor that is entirely acceptable on a heavy line and transformer may cause serious disturbance on a line where it forms the major portion of the load. A third form of rule reads, in effect: "No starting device will be approved that disturbs the regulation or continuity of service to other customers." This rule goes to the heart of the matter; it needs only to be amplified to define what constitutes disturbance and to state the duty of the power company in providing lines and transformers. The following form of rule is suggested:

"No motor installation shall be approved if it causes more than 5 per cent instantaneous voltage drop to other customers on circuits on which lighting is a part of the connected load, or more than 10 per cent on circuits used for power purposes exclusively; provided, however, that upon reasonable notice it shall be the duty of the power company to provide lines on which the voltage drop will not exceed these figures when the current drawn from the line does not exceed the N.E.L.A. limits."

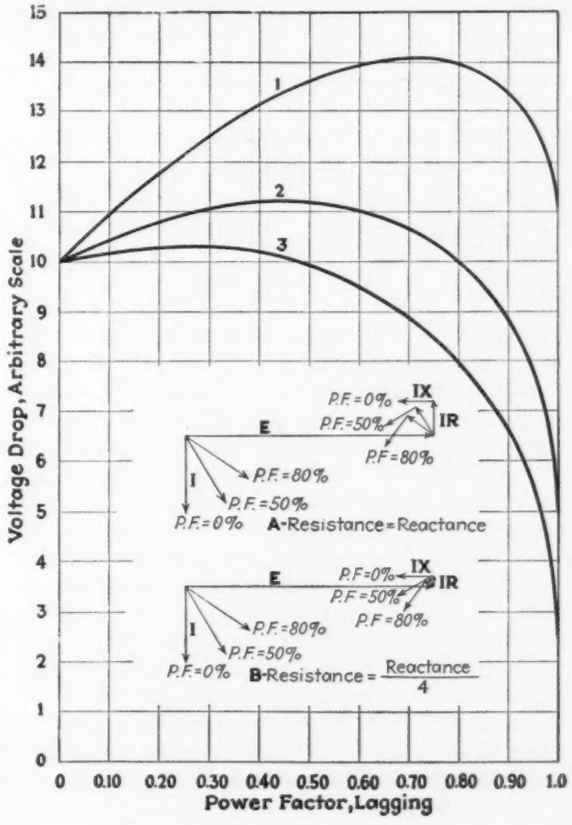
Such a rule, with definitions of reasonable notice, and with provision for the amortization of the cost of the necessary construction from the energy charge, will cover all cases. The provision regarding cost of construction will place a premium on extra-low-current installations, such as slip ring or internal-resistance-start motors, in situations where they are really of distinct advantage, without penalizing high current installations on lines sufficiently heavy to carry their current demand. As has been demonstrated in the first part of this article, the effect of power factor on line disturbance is negligible within the range found in induction motors, so current demand, without reference to power factor, is the proper standard.

LINE DISTURBANCE EFFECTS OF MOTOR-STARTING CURRENTS PLOTTED AGAINST POWER FACTOR

Curve 1 and vector diagram A represent the impedance drop of a 10 to 20 kva. transformer, or of a line of No. 0 wire with 15-in. flat spacing, or of No. 000 cable in conduit. These have resistance and 60-cycle reactance approximately equal. On this class of line or transformer or on anything smaller the greatest voltage drop is produced by a current at power factor greater than 0.6; low starting power factor is actually an advantage from the standpoint of voltage drop. Most 2,300- or 4,600-volt primary distribution lines will have approximately these characteristics; many of the smaller ones will have even higher ratios of resistance to reactance than these, and hence will place a decided premium, from the standpoint of voltage drop, on power factor below 60 per cent.

Curve 2 is for a typical 50, 60 or 75 kva. transformer bank, or for No. 000 wire with 30-in. flat spacing, or No. 0000 wire with 15-in. flat spacing, or 500,000-circ.mil cable in conduit. It may be considered representative of the lines serving many small manufacturing plants. On these lines or banks resistance is about half as great as 60-cycle reactance. Here the greatest voltage drop is produced by a given current at 0.4 to 0.5 power factor, and there is little advantage within the range from 0.3 to 0.65, which is the range of the single and double squirrel cage designs. A motor arranged for high resistance rotor at start, either the internal resistance or the slip ring type, will show from 3 per cent to 10 per cent less voltage drop than any squirrel cage type.

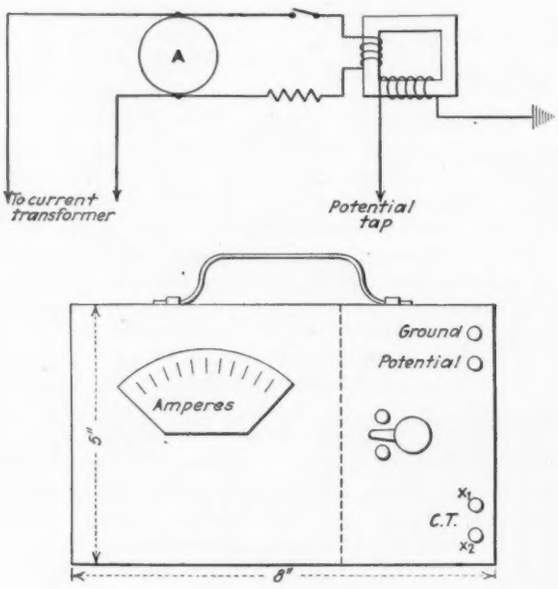
Curve 3 and vector diagram B represent a 150-kva. transformer bank, or a heavy secondary distribution line of 400,000 to 500,000-circ.mil cable. On a line or transformer of this size resistance will be only about one-fourth of reactance. Here power factor in excess of 0.55 is of real advantage in reducing the voltage drop. Among the normal slip squirrel cage motors only a few of the high-torque, low-current, high-reactance type show such high starting power factor. Some of the high slip motors, such as elevator and hoist motors, will cause 15 per cent to 20 per cent less line disturbance per ampere, and all of the internal resistance or slip ring type of motors will show a decided advantage. On a line or transformer of this size, however, only a large motor will cause objectionable disturbance.



Network System Load Testers

By CARL W. EVANS
San Antonio Public Service Company, San Antonio, Tex.

ONE of the most important details in secondary network system operation is the prevention of overloads on secondary mains. After the first installation of a secondary network system it is quite usual that extensive load tests be made upon the secondary system to eliminate the possibility of overloads under various conditions of feeder outages and the corresponding load shifting which occurs. After this initial test, however, occasional investigations must be made when new services are connected, new vaults installed or other changes occur affecting secondary main loadings.



Ammeter with energy direction indication added

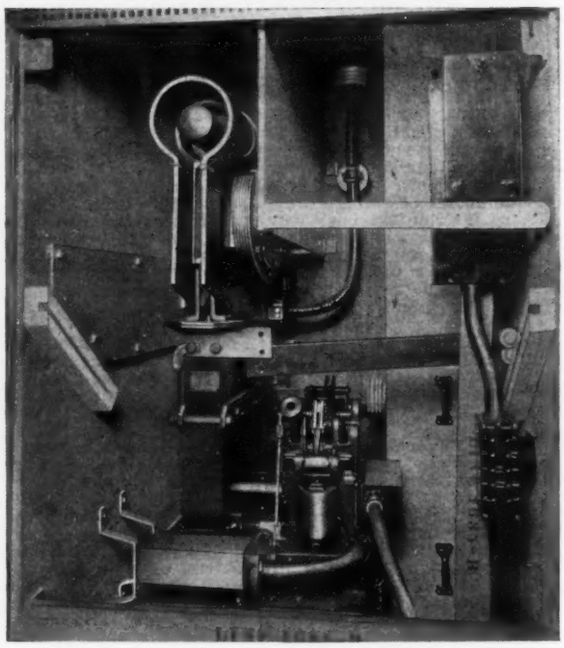
This arrangement obviates the use of a wattmeter to determine direction of energy flow when making current checks on a.c. network secondaries.

Such tests are made in a variety of ways, principally with portable split-core line test sets. In making an intelligent investigation of load currents on a network system (unlike the test procedure of the radial system) it is essential that the direction of flow of current be known as well as the magnitude. This information cannot be obtained from the split-core ammeters and therefore requires an additional instrument in the form of a wattmeter. The bulkiness of a test outfit including a line test set and a wattmeter led the writer to develop a device which would give both magnitude and direction of current with a minimum of apparatus required.

The only apparatus required is a small transformer, a small resistance and miscellaneous switches, leads, etc. The transformer is easily constructed from a meter potential coil, the secondary being several turns of No. 18 bell wire wound for a potential of two or three volts. The resistor should be such as to give a reading on the ammeter of about 2 or 3 amp. The ammeter should read 10 amp. full scale and should be used with a split-core transformer giving 5 secondary amperes at full load.

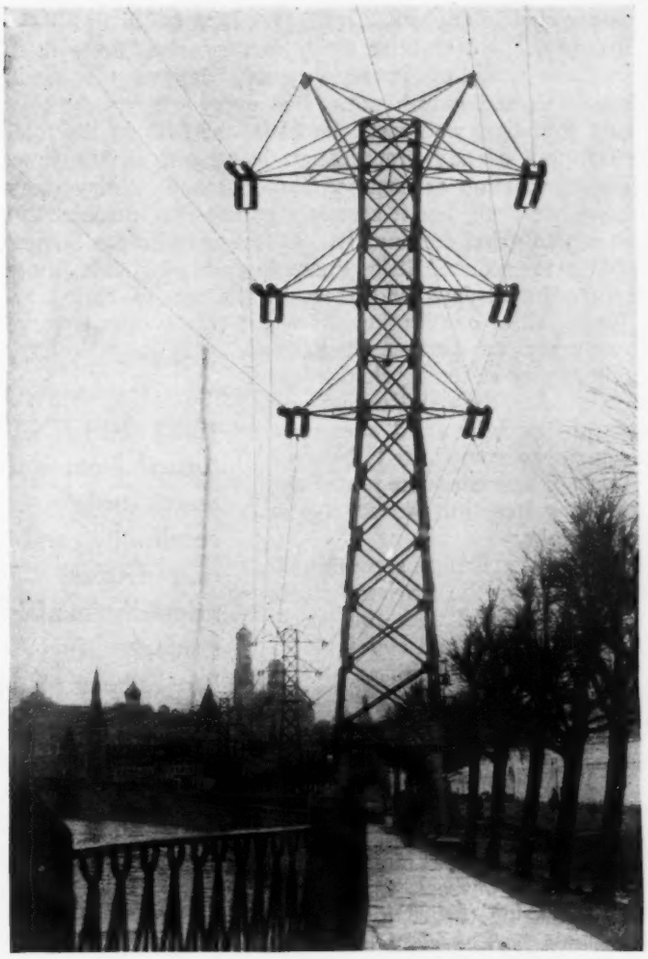
The operation of the set is as follows: The current transformer secondary polarity should be marked plainly so that connections will never be reversed. A calibration test should be made upon a circuit of known current direction. During this test it will be noted that the small amperage due to the potential transformer either increases or diminishes the reading on the ammeter. This fact should be noted as well as the direction of current through the split core. In future tests it is necessary only to read the ammeter with and without the potential transformer switch closed and note whether the reading has increased or decreased. From the previous calibration test and the polarity marks on the current transformer it is then a simple matter to determine the direction of the current. It should especially be noted that the potential must be tapped on the same phase upon which current is being measured. Because of the small space required for mounting the transformer improvised from a master potential coil the over-all dimension of the ammeter unit is only 8 in. x 5 in. x 4 in., making it easily handled.

DEÏON BREAKERS IN STANDARD SERVICE



Deïon circuit breakers are beginning to appear in try-out installations on operating systems. This 12-kv., 600-amp. breaker in the Washington Park substation of the Commonwealth Edison Company in Chicago serves a distribution substation feeder

RUSSIA as an ELECTRICAL MARKET



By A. B. DIBNER

Vice-President Burndy Engineering Company

TECHNICALLY, there are two developments in Russia that stand out above its industrial revival. Both are of a planning nature. Russia, having at present a dictatorial government, is able to introduce revolutionary changes with little opposition and in a short time. The Gosplan is the eye of the government that looks to the future. Its function is to lay the general lines for the industrial advance. This may involve the construction of a city in a wilderness, the building of high-tension network to include central stations, transmission lines and distribution lines, or the erection of tractor plants to supply 100,000 tractors a year. Such planning is highly desirable for the sake of efficiency, although there is ground for argument regarding how the plans are executed. It is this that the western world watches with such interest.

The great child of the Gosplan is what is frequently referred to as the "five-year plan." It was the decision of the authorities that Russia must industrialize the same as her western neighbors and do so in a short period of time. The industries to be created in this gigantic undertaking will include the construction of great steam and hydro plants, interconnecting systems, the building of automobile tractor plants, the construction of canals and railroads and the upbuilding of a chemical industry, where nothing existed before. The total expenditure will involve some $33,000,000,000, and it is the execution of this mammoth job to which the authorities have pledged themselves and upon which their rise or fall depends. Nothing is spared to bring about the successful outcome of this plan.

The five years in which this construction is to be accomplished commenced October 1, 1928. Every able-bodied man has become a partner in the successful completion of this program and is fired with a zeal kept burning by the innumerable organs of publicity that the Soviets monopolize. Therefore there is something akin to religious fervor behind every pick and shovel in Russia. It is this amazing side that is of such interest to the foreign visitor.

Energy may be expended in the wrong direction, or consumed in the elaborate political rites that surround the daily life of the Russian worker, but certainly the goal for which the Russian worker strives is kept before him, clearly and constantly.

To accomplish rapid industrialization of Russia, the Soviets have hit upon a scheme that would hardly be possible in any other country. It is called the "five-day week" and requires every factory, shop or store to continue unending operation every day of the week, month in and month out. But every employee works only four days and rests the fifth, one-fifth of the total employees of any organization being out all the time. The elimination of common Sundays and holidays may make life drab, but it certainly permits the machines in Russia to grind continually. In this manner the Soviets strive to reduce their unemployment, provide more frequent rest days and step up the use of their machinery all at one stroke. Whether this system is to be temporary or permanent has not yet been decided.

A similar sweeping change was made when the old Russian system of weights and measures, even more complicated than the English, was eliminated and the metric system introduced also at one stroke.

Sweeping changes seem to hold no fears for the Soviets, which, when impressed with the necessity for change and belief that a better tool is at hand, as readily change a social habit as the name of a village.

An interesting institution exists in Moscow—the Central Institute of Labor—a combination trade school and labor laboratory. There one can see hundreds of unemployed barbers, tailors and lawyers being turned into skilled mechanics. The eighteen-month course trains the unskilled hand, limb and eye to strike chisel with hammer in rhythm with the periodic stroke of the gong and movements of the muscles are controlled by a contraption of levers and straps. In no way is the metamorphosis of the individual to the mechanical better demonstrated.

No doubt much good can come from this institute, one of the nobler works being the very thorough analysis of fatigue in all its chemical and psychological phases. Every one of the 15,000 students who come annually to this institute is subject to fatigue tests, so that the accumulated data and results may some day be internationally recognized.

The general craving and groping for industrial knowledge is extremely well illustrated by the stores to be seen on the main thoroughfares of all the larger Russian cities, in which nothing but apparatus and literature for the home study of physics and chemistry are sold. The gaze of the passerby is arrested by windows containing test tubes and retorts, placed in front of charts and graphs showing the physical properties of matter. This is the mental food most tasteful to the Russian palate today. Russia follows only Japan in numbers of foreign subscribers to the ELECTRICAL WORLD, and some twenty-five engineers are members of the A.I.E.E.

Of further interest to the American manufacturer is the main office of Technogostorg in Moscow. This governmental office was created for the purpose of facilitating the purchase of proper foreign equipment by Russian engineering authorities. It has a library of foreign technical literature and catalogs unparalleled by any known to the writer. This is supplemented by an elaborate display of technical machinery and equipment covering all branches of industry.

The first industrial purchases and attention given by Russians to any country were, of course, to Germany—a neighbor and a very willing source of supply. However, American credit and tempo seem to appeal much more to the Russian. Many an industrial leader speaks up with the hope that in fifteen years Russia is to be another America. It is probably this that leads Russians to admire American ways and methods so much more than the German today. The slogan everywhere is "Learn English," and an American in Russia is a very much admired figure for many reasons.

JUST RECENTLY Mr. Dibner returned from Europe, where an intimate study was made of Russian conditions, ambitions and methods of procedure. While the visit was primarily made to study Russia as a market for American equipment, Mr. Dibner made some observations which should also be interesting to international consulting engineers, financiers and even engineers who confine their attention to the United States.

The initial shock of seeing women do hard labor is softened by seeing women in every branch of activity. They mix concrete, sweep streets and use the oxy-acetylene torch as unnoticed as a man; one soon feels no surprise in meeting them in the construction camp and engineering offices. In fact, at the electrical headquarters of Russia—the Electrotok in Leningrad—one may as frequently be referred to a woman engineer as a man for information or examination of plant. Apparently, the women are not only deserving of the respect accorded men, but carry their responsibility with equal dignity.

The railroads are decidedly poor, not only in schedule, speed and equipment, but also in maintenance. Whether this is due to the lower standard or the concentration of capital in other activities, the fact remains that the railroads are sadly neglected. On the other hand, the planes, operated in conjunction with the German Lufthansa, give excellent service at rates lower than first-class European passage.

The total expenditure for electrification for 1929 was $200,000,000, financed by the Union, the individual states and the communities, according to the relative national or local importance. New plants already constructed and operating on a national basis generate 250,000 kw., of which 73,000 kw. is by hydro, 140,000 kw. by peat and only 38,000 kw. by coal and coaldust. At the termination of the "five-year plan" the value for peat and coal will be raised to 393,000 kw. and 324,000 kw., respectively.

The reason for the predomination of peat as a source of energy is due to the fact that the rich anthracite beds are located in southeastern Russia in the Donetz Basin, some 400 miles from Moscow, and similar large points of consumption. The railroad haul over these long distances is, under the present condition of the railroads, unwarranted, particularly in view of the presence of large peat beds comparatively near both Leningrad and Moscow. This peat is mined by a number of methods, varying from the primitive pick and shovel to the most modern hydraulic mining.

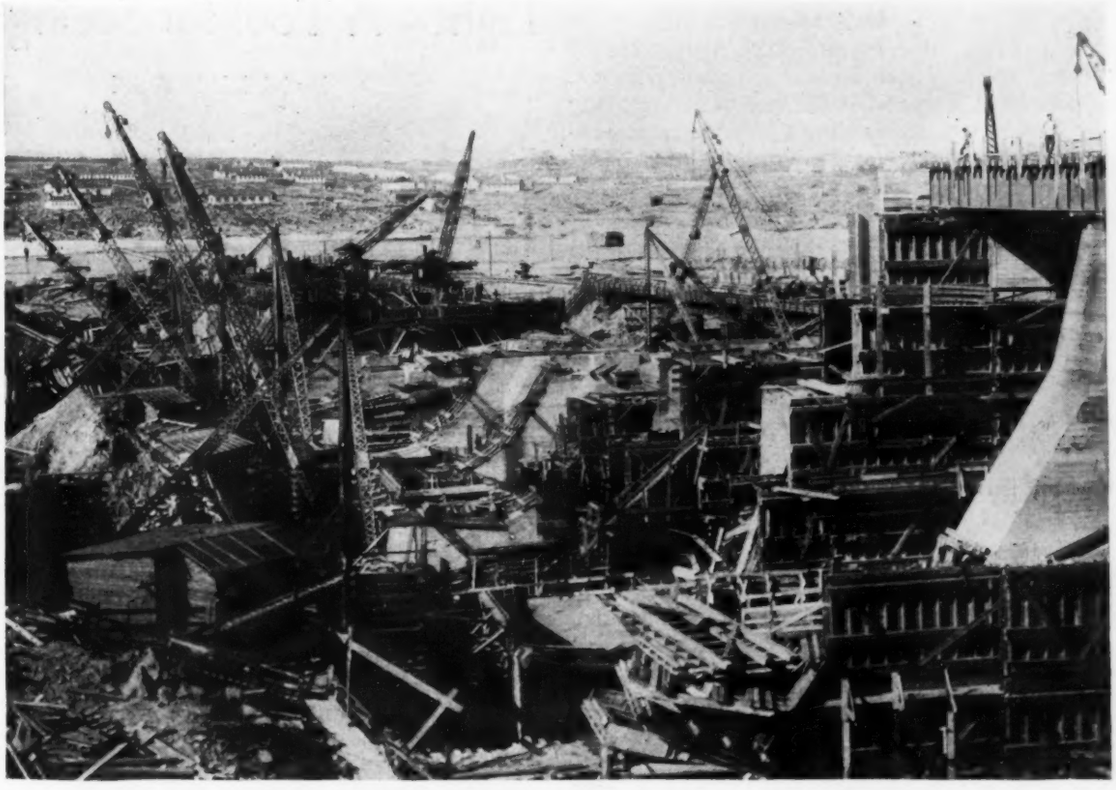
Plants under construction today are, however, largely coal-burning or hydro, as will be noted below. This is made possible by developing the Dnieper River at Kichkas and concentrating many new industries close to the coal regions, as at Rostof and Stalingrad. The generating capacity of the group at present under construction totals 796,000 kw. (initial output), with plans for ultimate extension to 1,285,000 kw. Of the present group, 473,000 kw. will be hydro generated, 110,000 kw. will burn peat, 170,000 kw. coal and coaldust and 43,000 kw. will use petroleum from the rich and well-known sources of supply in the Baku oil fields.

Plants still included under the "five-year plan," on which construction has not yet begun, but for which money has been appropriated, cover a total capacity of 1,021,000 kw., distributed among 22 stations.

There is an increasing list of concessions available to Americans for entire power plants of first-line capacity, totaling at present some 512,000 kw. of national importance alone. This includes an 80,000-kw. hydro and a 60,000-kw. coal-burning station. These are among the 22 stations totaling 1,021,000 kw. of plants forming part of the national scheme for immediate construction, but the financing of which has not yet been fully determined, although preliminary negotiations have been started.

Pre-eminent in this group is the Dnieprostroy hydro station, rising out of the wilderness on both banks of the Dnieper. Design and supervision of construction are under the direction of Col. Hugh L. Cooper. The river is dammed by a concrete structure that will raise the river level 160 ft. above the rock foundation. The immediate capacity of the four turbines will be 330,000 hp., with an ultimate installation of 750,000 hp., generated by nine units. Each of the four initial units is a General Electric 77,500-kva., 13,800-volt, three-phase, 50-cycle, vertical-shaft waterwheel-generator.

The energy generated will, in all probability, be distributed chiefly to vast local electrochemical works for the manufacture of aluminum, ferromanganese and electrical steel. However, the plant will also serve an area of some 300-mile radius, equivalent to our six New England states. A portion of the energy will also be sent at 220 kv. to the Don Basin and to Ekaterinoslav, an industrial center 60 miles north.



Dnieprostroy dam, which will eventually develop 750,000 hp. in Russia

Built by Hugh L. Cooper, using American construction machinery largely and employing many women

It is contemplated that this plant will be completed by 1934 at a cost of about $110,000,000 for power and navigation facilities.

The maze of steam shovels, hoists, locomotive equipment, rock drills and cofferdam steel, all of American manufacture, make the general appearance like that of any similar American locale.

At the Krassny Oktiabre plant, which is being erected near Leningrad, the steam equipment is being installed under the supervision of Metropolitan Vickers, this organization having received the major contracts for supplying this equipment. It is being brought up to the very latest construction in peat-burning equipment. Some of the 5,000 men and women engaged in the work are

installing German and Swedish high-tension transformers and oil-circuit breakers in a well-laid-out outdoor yard. The outdoor high-tension buses are supported by Thomas-Hewlett insulators.

The enormity of the entire Russian electrical program should be magnified in view of the dearth of technical materials and trained labor, the poor condition of transport facilities, and particularly the out-of-way locations of power plant sites. To this must be added the background of a national purchasing organization with a future questioned abroad, where the bulk of the required equipment is to be purchased. The situation is one in which credit is limited and the great bulk of finance is derived from a population staggering under an enormous tax load. To finance a capital investment of $33,000,000,000 from a population whose average monthly wage is only $35, with a purchasing power of only 59 per cent of pre-war value, requires a reinvestment of national income varying from 36 per cent to 48 per cent, graduated over the five years. The standards of living imposed by such heavy taxing allows only the most fundamental necessities. Imports of anything but industrial equipment are prohibited and the sale of everything salable abroad (except works of art) help raise the necessary funds to carry the gigantic task through.

Still, neither the iron discipline and untiring energy of the 1,000,000 organized Communist leaders nor the self-sacrifice of the bulk of the population could be possible if all Russians were not fired with enthusiasm in their belief that they are contributing a new form of organized society which the world needs and must eventually turn to.

Popular interest in electricity is strong in Russia

One phase of this enthusiasm is the general interest of the citizenry in electric power stations. It is in these embodiments of the technical ideals of the Soviets that the laborer and peasant see emancipation from the earthly labor that has been their lot through the long, dark years of Russian history. In no better way can the authorities win their allegiance and co-operation to their plans for industrialization and mechanization. It is no uncommon holiday that finds 500 or 600 laborers and peasants being guided through the larger steam stations.

What is the condition of the engineer in Russia? Fortunately for this profession, the upward industrial trend puts a high premium on all technical ability. The engineer is therefore the most-sought-after person in Russia, enjoying the highest salary as a group. Where the physician must be content with some $75 per month, the engineer's salary frequently reaches $200. Otherwise professionals enjoy very little privilege. For instance, the lawyer must adjust his living to the $60 or $70 per month allotted him by the government. Still he is no better off than the higher grade teacher, who is also in the $75 a month class.

Graft seems non-existent, due in part, no doubt, to the summary executions that follow such guilt. This, of course, each one must determine for himself, and much material is now available upon which to base a decision.

Should American manufacturers make any effort to cultivate the Russian markets? Obviously, no country needs technical equipment more than Russia, nor is any country more hungry or more conscious of her technical shortcomings. The difficulty lies in the condition of non-recognition of the Soviets as the real government today, and following that, the lack of credit for the purchase of electrical material. So great is the market vacuum that the German advance of $90,000,000 is insufficient, and Russia looks to America for more. Many large American organizations have already invested millions, but the natural hesitancy on the part of the average manufacturer is due to the uncertainty of Soviet stability.

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Light—A Tool for Seeing

By M. LUCKIESH
Director Research Laboratory, National Lamp Works, Cleveland

IT HAS been demonstrated in many ways that improved lighting sharpens the visual sense and produces a general increase in industrial efficiency. The demonstration of these effects, however, is often a difficult task because of the many factors involved and the complexities encountered when dealing with the human machine. As a result, the contribution that lighting makes to the work-world is usually presented, for simplicity, as a certain percentage increase in the amount or precision of the work done without attempting to indicate the benefits to the individual worker. An analysis of test data from the standpoint of the individual will not only yield powerful arguments for better lighting, but also indicate specific means for a further development.

Since 40 per cent or more of industrial workers have defective vision, the benefit derived by this group from improved lighting should be a vital factor in lighting programs. The following data bear directly upon this subject. The test was designed to show the relationship between intensity of illumination and the speed of performing a task which involved critical vision. The improvement in lighting was made by raising the level of illumination from 3 to 12 foot-candles.

Classification of Workers	Per Cent Increase in Production
Group with better eyes	14
Group with worst eyes	22

Thus light as a tool for seeing gives the greatest assistance to those equipped with the poorest visual apparatus. Since the eyes respond so definitely to the influence of better lighting, it seems justifiable to expect a worthwhile improvement in vision from a well-lighted work-world.

Another phase of the reaction of the individual to illumination is taken from researches conducted by the U. S. Public Health Service. In this case a number of workers were divided into two equal groups: (1) Those who responded most to improved lighting and (2) those who responded least.

Response to Illumination	Time Required for Task
Group with greatest response	27.4
Group with least response	21.9

This experiment indicated that the group of men who were slower workers received greater help from the improved lighting than did the faster group. Here, again, lighting acts as an agent toward balancing the inequalities in the performance of human machines. Good lighting helps those most who need it most.

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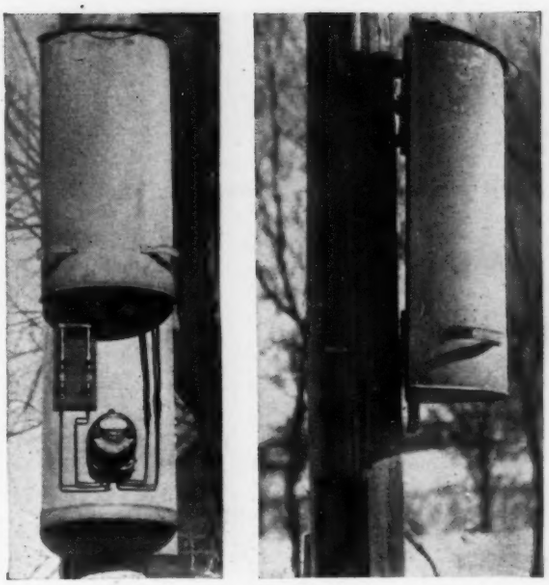
Protection and Accessibility of Rural Service Meters

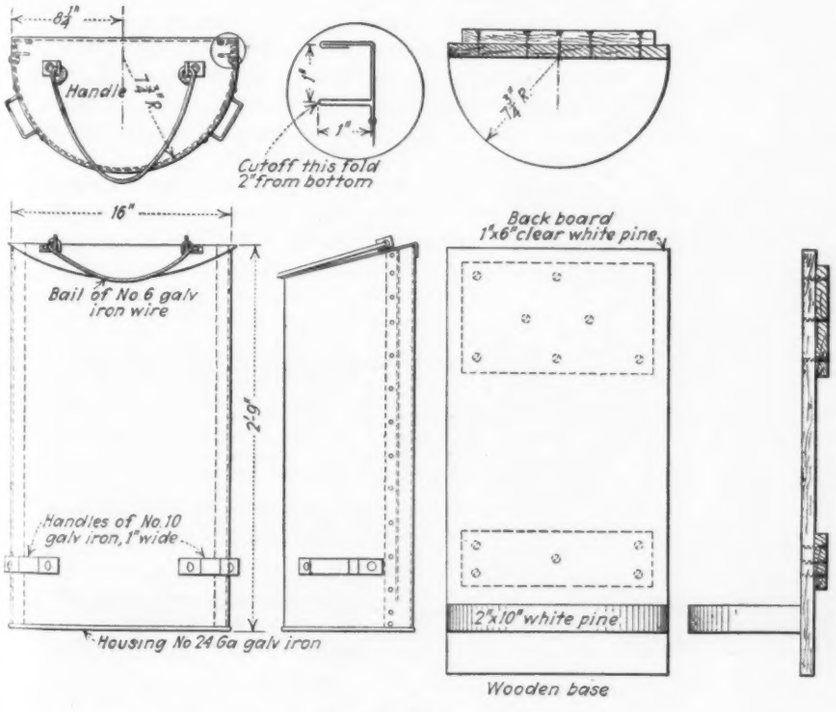
By K. R. MacKINNON
General Superintendent
Nebraska Power Company, Omaha, Neb.

THE problem of protecting and making easily accessible meters and entrance switches on rural service installations in an arrangement that combines the requirements of adequacy and economy has been diversely solved by electric utilities supplying this class of service. The means used by the Nebraska Power Company is illustrated in the accompanying illustrations. The meter and service entrance switch are mounted on a white pine back-board 3 ft. long, 1 ft. 3 in. wide and 1 in. thick, which by means of top and bottom cross cleats of wood is hung on the service pole at a convenient height above the ground. The cover consists of a half cylinder of No. 24 gage galvanized iron which is closed at the top with a slanting roof to shed the rain. The side edges of the half cylinder carry a groove 1 in. wide and 1 in. deep on the inside which slides over the edges of the mounting board. The box is closed at the bottom with a semi-circle of $1\frac{5}{8}$-in. pine held by screws to the mounting board. The meter loop drops are carried down the pole in conduit which enters the inclosure through the top of the mounting board. When the meter is to be inspected or a fuse replaced in the entrance switch the cover is simply pushed up on the board and is held in the open position by a galvanized wire bail which is fastened to the top of the cover and is held by a hook mounted at the proper height on the pole. The conduit is grounded to the system neutral at the top of the pole and the galvanized cover is connected to the conduit by a flexible lead which permits the cover to be moved up and down without disconnection.



Inclosure for entrance switch and meter in rural service

The advantages of outdoor meters for farm services which are made possible by such an installation as is described here are thoroughly obvious. The meter can be read at any time, whether the customer is at home or not. This removes the necessity for going back for skips, which is very expensive in rural service. The outdoor installation makes it unnecessary to carry large capacity service into any building and out again to other structures. With an outdoor distribution pole permanent and temporary loads can be added with the least disturbance to existing service and metering equipment.



Design and dimensional details of rural service meter housing

Syracuse sets new pace in night football

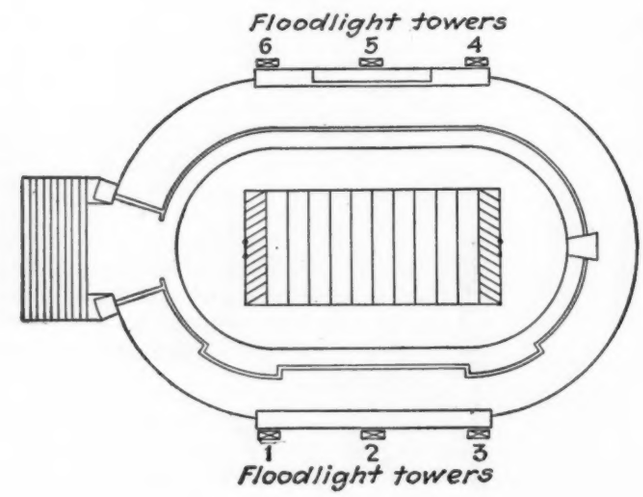
Night Football Is Practical

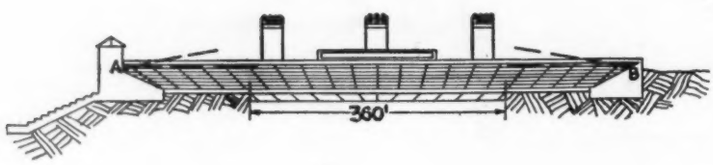
By W. C. PEARCE
Syracuse Lighting Company, Syracuse, N. Y.

THE past year being the occasion of Light's Golden Jubilee, the electrical interests in the city of Syracuse, N. Y., decided to do something unique with light to show the possibilities of its use. Accordingly, a committee was appointed by the Syracuse Chamber of Commerce to consider the problem and act. After weighing several different plans, it was decided that the most novel one was to hold an intercollegiate football game at Syracuse University at night. The idea was readily accepted by the university authorities and on September 28, 1929, Syracuse University played Hobart at the stadium in Syracuse in the first Eastern night football game.

This early season game has always been considered more or less of a practice game. It never drew a crowd and was never a financial success. However, when the two teams were lined up for the kick-off 25,000 to 30,000 people were seated in the stadium. The spectacle was one that has never been witnessed in the daytime. It seemed as though a beautiful green colored rug of very large size had been laid on a brilliantly lighted stage for the players. Regardless of the play, the ball was always easily followed. The travel of the ball on a high punt could be followed as easily as a long pass. The spectators were astonished. They had not expected such a fine demonstration of the possibilities of light and much comment centered about the fact that the game could be followed more easily than in the daytime. The stadium was so crowded that hundreds of people were turned away. The success was far greater than anticipated.

After the game the coaches and players stated that they could see no particular difference between playing at night and in the daytime and did not notice glare at any time during the contest.





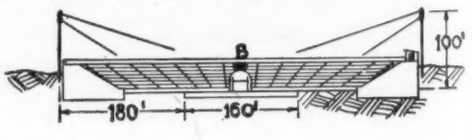
Lighting layout in Syracuse stadium

Floodlights—44 Crouse-Hinds type LCE 24 No. 40,468 with 40 deg. spread lens and louvers.

Lamps—1,500-watt G-40 bulb, 115-volt floodlight lamp.

Towers—Nos. 1, 3, 4 and 6 are each equipped with seven floodlights. Nos. 2 and 5 are each equipped with six floodlights.

Locations A and B are each equipped with two floodlights having louvers for bottom cut-off.



The success of the first night game prompted an additional game at night, which was played between Syracuse University and Johns-Hopkins. Once again an unusually large crowd was present. The floodlights were mounted in banks 180 ft. distant from the edge of the playing field and 100 ft. above same. It was necessary to use large floodlighting projectors having a very high efficiency and a narrow beam spread to confine the light entirely to the playing area. In order to prevent glare from the eyes of spectators sitting opposite the floodlights louvers or vanes were installed.

Properly to light high punts two floodlights were mounted at each end of the stadium. These floodlights projected the light parallel to the sides of the field and were equipped with louvers to prevent the light from the units from being blinding either to the spectators or to the players. This light was found to be very effective in following high punts as the light was projected on the ball from the same side that the player views it.

A total of 44 Crouse-Hinds type LCE 24 floodlights were used, each one being equipped with a 1,500-watt lamp, making a total of 66,000 watts for the installation.

▼ ▼ ▼

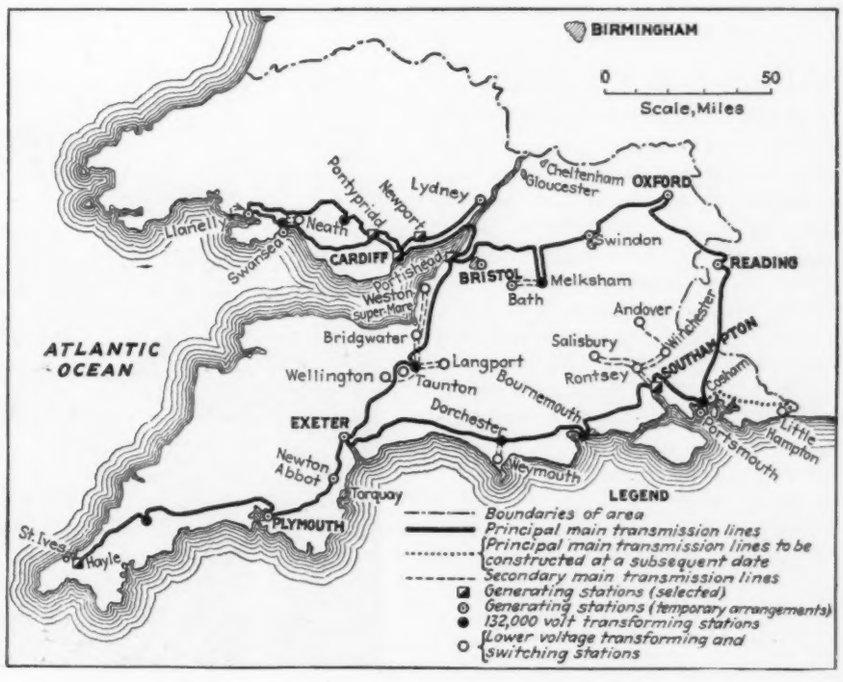
British Grid Scheme Progressing

REMARKABLE progress in the preparation and carrying out of the new regional schemes for the co-ordinated development of generation and main transmission, in accordance with the policy of the British electricity (supply) act, 1926, is recorded in the ninth annual report of the British Electricity Commissioners for the year ended March 31, 1929, which has just been issued.

Three further regional schemes for central England, northwest England and north Wales, and mideast England, respectively, were adopted during the year with certain modifications by the Central Electricity Board. The five schemes in all adopted by the end of March covered more than 43 per cent of the total area and as much as 75 per cent of the total population of Britain and embrace the areas of supply of some 450 authorized undertakers, whose operations accounted for upward of 80 per cent of the total sales of electricity to consumers in Britain in 1927-28. The total value of the contracts placed by the central board at March 31, 1929, in respect to primary and secondary transmission lines, associated transforming stations, and other works, amounted to approximately £8,150,000 ($40,750,000).

The increasing favor with which the industry has come to be regarded as an outlet for capital investment has not been confined, the report says, to British interests alone. In the course of proceedings before the committees of Parliament on a private electricity bill promoted and passed in 1927 evidence was given of the intention of the promoters to have recourse to American capital for the development of the proposed undertaking. The desire on the part of external interests to secure a still wider participation in electricity supply undertakings in Britain has been shown during the past year by reported investments of American capital in the acquisition of holdings representing a controlling interest in various electricity supply companies in Britain. So far as the commissioners are aware, considerations as to the country of origin of capital invested or as to the nationality of the holders of shares have not hitherto arisen in connection with the financing or control of electricity supply undertakings carried on under statutory powers in Britain.

Including the central board, the number of separate undertakers at the end of the year was 659, an addition of seventeen to the 1928 figures. Authorized undertakers developed 9,473,201,134 units, while railroad and street car authorities and non-statutory undertakings brought the total to 10,878,980,925 units. This was an increase of upward of 9.5 per cent on the figures for 1928. The larger output was obtained by an increase of only 3.7 per cent in the amount of coal and coke con-



Proposed superpower zone in southwest England and south Wales—the final "grid"

sumed, and there was a falling off by about 4,800 tons in the amount of oil fuel used. Electricity production at the stations included within the scope of the returns has increased by upward of 110 per cent since 1920-21, representing an average increase of 13.8 per cent annum during the past eight years, notwithstanding the fluctuating conditions of trade and industry during that period. There has been an all-round increase of 60 per cent in the amount of electricity produced per ton of coal and coke consumed for that purpose compared with 1920-21.

Energy use 171 kw.-hr. per capita in 1928

Last year the units sold by undertakers amounted to 7,603,240,446, an increase of 11 per cent on the 1927 figures, and a total increase of over 108 per cent since 1922. On the basis of the estimated total population of the United Kingdom at the end of 1928—44,370,000—the sales of current from public sources of supply in that year represented an average consumption of 171 units per head of population. The curve of estimated growth in the output of current during the years up to 1933-34 and thereafter up to 1940-41, which was prepared by the commissioners as a preliminary to the formulation of the new regional schemes, forecast the sale of about 7,500,000,000 units of electricity to consumers in 1928, compared with the realized sales of 7,603,000,000 units.

Urban and suburban centers have absorbed hitherto the chief activities of authorized undertakers, but one of the most important problems of the next few years will be to insure that the additional facilities are utilized to the best advantage in providing an electrical service for as large a proportion of the rural population as the economic circumstances of the supply will permit.

The provision of an electrical service in many rural areas of greater or less extent is dependent on the outward extension of the supply system of a neighboring urban undertaking. The electrical development of such rural areas will proceed on the basis of the establishment of a nucleus of compulsory mains, where such are prescribed by the order or act concerned, and the provision of suitable and sufficient distributing mains to meet the demand in the various parishes. On the other hand, there are considerable tracts of rural territory where the prospects of electrical development during the next few years are dependent on the formulation and carrying out of schemes for the supply of current in such portions of the areas as show a demand and a reasonable prospect of the supply becoming remunerative. Certain electricity district authorities and companies with large areas of supply are concerned with rural development on this basis.

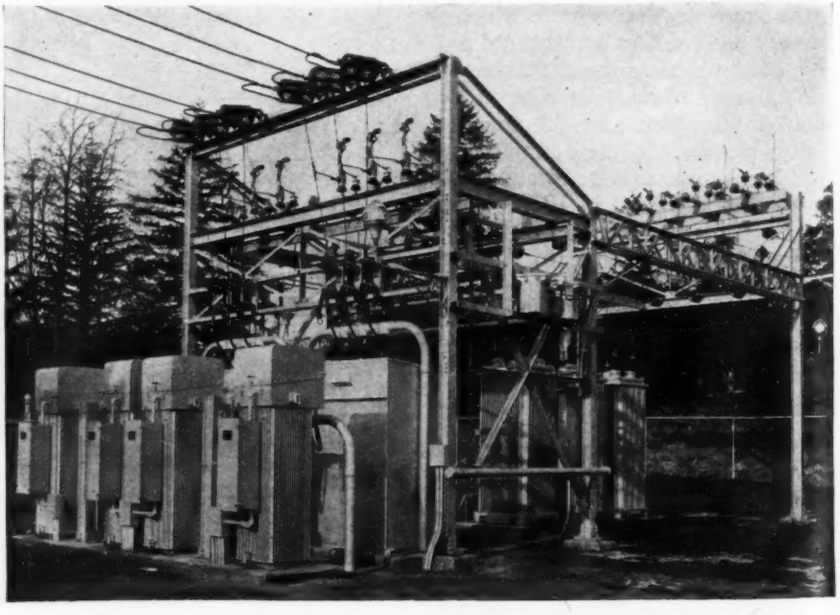
Up to the end of March proposals had been submitted for the development of about 3,400 square miles with a population of about 400,000 and involving an estimated capital expenditure of upward of $5,000,000 over a short period of years, and were either on the point of being approved by the commissioners or under consideration. Additional proposals were in course of preparation by the various undertakers concerned and others would fall due for submission in the near future. The carrying out of the schemes progressively submitted and approved will constitute a large program of development in the course of the next four or five years and represent an important contribution toward the electrification of rural areas.

The rural parishes supplied at March 31, 1929, numbered 1,435 and those not supplied 3,047. The commissioners propose to continue a systematic review of the progress made in the provision of distributing mains in rural areas and to explore the causes of or reasons for non-development in particular cases, in order to encourage and facilitate the establishment of a supply of electricity wherever there appears to be a reasonable prospect of supplies being given on a remunerative basis.

▼ ▼ ▼

Outdoor Substation on Simple Lines

CONTINUITY in energy travel from the entering line to the outgoing feeder circuits contributed to economy of space utilization and minimum material requirements in the East Greenwich, R. I., substation of the Narragansett Electric Company. With the exception of the low-tension oil circuit breakers and relay apparatus, practically all the equipment is of the outdoor type, including feeder regulators. The energy travel is from right to left and the symmetry of the installation facilitated speedy construction.



Line Extension Rules Prove Sound

Six years' experience proves soundness of policy requiring customers to advance deficit incurred or prepay revenue during development period

By C. MAYNARD TURNER

Assistant Chief Engineer
Department of Public Works, Olympia, Wash.

EXTENSION of electric service to rural districts requires a greater investment per customer than does the extension of service to new customers in urban communities. This results in a greater cost to the utility and the greater cost means, theoretically, higher rates. Efforts of utilities and state regulatory bodies to formulate a line extension policy that would protect the utility and its existing customers and at the same time make it possible for rural districts to enjoy the benefits of electric service have taken form in a wide variety of policies and rules. There are several methods of serving rural districts without jeopardizing the utility's investment or reducing its return. Following are four of the methods most commonly used:

1. The customer may build the extension necessary to furnish him with service, thus eliminating the necessity of added investment on the part of the utility.

2. The customer may contribute a definite amount of money to offset the amount of additional investment.

3. The utility may charge higher rates on extensions to compensate it for the greater expense and fixed charge.

4. The customer may be served under the rate schedules applicable in the territory in which he lives by paying in a lump sum enough money to make up the deficit caused by the greater expense of rendering service during the development period of the line. This sum is designated as "Prepaid Revenue."

All of these methods, in one form or another, have been used with a varying degree of success. Several of them were used by the utilities in the State of Washington until the Department of Public Works adopted a standard policy in 1923.

The first method of customer-owned lines is unsatisfactory because of the lack of maintenance on the part of the individuals and because of the liability factor. In the second plan there is always the complaint of paying for the line and turning it over to the utility as a gift. It also creates a source of discrimination. The paying of rates in accordance with the cost of the extension causes undue bookkeeping on the part of the company and much confusion on the part of the regulatory body as each line would be subject to different schedules.

The last method enumerated provides for the construction of new extensions to the benefit of the majority of applicants and enables the utility to render service under established urban rates without changing the ratio of its investment to its revenue. It also prevents placing an undue burden upon the existing customers of the utility. After a great deal of thought and study by utilities of the state and by the Washington Department of Public Works this is the policy that was adopted and which has remained in force unchanged since 1923.

All class A and B electric utilities operating in the State of Washington are required to file, as part of their tariff, a standard extension schedule applicable to the various districts served by them.

The extension rules, however, affect all class C and D utilities, as well as those filing extension schedules.

In the basis of this policy there is the assumption that the utility is making a fair return on the capital already invested in distribution facilities. The amount of

Table I—Figures Used in Determining Deficit to Be Paid by Customers on Line Extensions

	A	B	C	D	E	F
Investment ratio	2½ to 1*	2 to 1	1⅔ to 1	2 to 1	2 to 1	1½ to 1
Deficit percentage	20	20	20	20	20	20
Development period	14	10 15†	10	3 15‡	10	10
Cash equivalent	$45	$50	$46	$40	$35	$45

*Exclusive of transformer investment. †Outside city limits. ‡Variable.
A—Puget Sound Power & Light Company.
B—Washington Water Power Company.
C—Pacific Power & Light Company.
D—Gray's Harbor Railway & Light Company.
E—Peoples West Coast Hydro-Electric Corporation.
F—Portland Electric Power Company.

investment per dollar of revenue is obtained by dividing the total investment in distribution system equipment by the total revenue received by the sale of current therefrom. This figure, termed the "Investment Ratio," is applied to the revenue expected from the proposed extension during the first year to obtain the company's initial investment in this particular line. The extension rules provide for a minimum investment per customer of one "extension unit" or a "cash equivalent" to be not less than

Table II—Growth of Rural Business of One Utility Under Line Extension Regulations

At End of	Miles of Line Added	Total Miles of Rural Line	Number Customers Added to New Line	Estimated Number Customers Added to Old Lines	Estimated Total Customers Added	Estimated Total Rural Customer
1922	...	1,330	.....	.....	.....	15,960
1923	220	1,550	2,090	665	2,755	18,715
1924	250	1,800	2,375	660	3,035	21,750
1925	500	2,300	4,750	750	5,500	27,250
1926	600	2,900	5,700	1,500	7,200	34,450
1927	337	3,237	2,739	2,821	5,560	40,010
1928	461	3,698	3,381	2,834	6,215	46,225

$35 per customer. The difference between the company's initial investment in the line and the actual estimated cost of construction gives the "excess cost."

The utility's operation expense, taxes, depreciation, interest, etc., are determined as a percentage of the fixed capital involved and the sum of the percentages is called the "deficit factor." This factor is applied to the excess cost of the line to determine the amount of additional revenue necessary during the first year to cover all costs not covered by the effective tariff.

It must be assumed, of course, that on an average all extensions grow to be self-supporting within a certain period of time. This average "development period" must also be filed in the utility's extension schedule. Under the assumed conditions of gradual growth the revenues will increase and the deficit will diminish, resulting in an average annual deficit of one-half the amount applicable to the first year. The average annual deficit would be the amount that would have to be collected each year from each extension to cover, over the development period, all expenses incurred above those paid for by the utility's rates. However, to insure the collection of this revenue and to simplify the application of the extension rules, the customer must pay this amount for the full development period in advance of service. From this total advance revenue payment, which may be divided equally or in any other way satisfactory to the customers, must be deducted an amount equal to interest at 5 per cent on the amount that would be unpaid from year to year during the development period. In other words, the customer is entitled to interest upon the annual payments that are made in advance. The payment made is not a contribution to the cost of the line but is advanced revenue to cover the deficit which occurred during the unprofitable period of growth.

Any applicant for service within five years (three years previous to July 1, 1929) after service is first rendered over an extension must pay his pro rata share of the prepaid revenue unless the cost of additional construction to serve him requires a prepayment larger than that made by the existing customers, in which case the additional construction is considered as a new extension.

Method of application

Upon request for electric service the utility is required to investigate the possibility of rendering such service. If the new extension will be self-supporting the utility will complete the construction as soon as possible. However, if the utility finds that the cost is in excess of its initial investment as determined by the investment ratio, it will proceed under the standard rules. The utility must make up a standard form containing a sketch showing the details of construction, a detail of the cost, a list of the prospective customers, together with their estimated revenue, and the computation of the customers' payment. This record must be preserved for five years. An example, perhaps, will clarify this discussion.

Utility "X" has filed in its tariff an extension schedule containing the following information:

Development period.... 10 years
Investment ratio ..... 2½ to 1

		Per Cent
Deficit factor..... 20 per cent	Return	8
	Taxes	2
	Depreciation	4
	Operation	5
	Risk and contingencies	1
		20

Five prospective customers with an expected first year's revenue of $170 request service requiring an extension estimated to cost $750. The customers' advance revenue payment is then computed as follows:

1. Estimated first year's revenue	$170.00
2. Estimated cost of extension	750.00
3. Minimum initial investment required by utility (2½ times Item 1)	425.00
4. Excess cost (Item 2 less Item 3)	325.00
5. Annual deficit first year (20 per cent of excess cost)	65.00
6. Average annual deficit (one-half of first year)	32.50
7. Development period	10 years
8. Present payment at 5 per cent to pay $1 per year for development period of ten years (compound discount table)	7.722
9. Present payment to pay average annual deficit of $32.50 per year for development period	250.97
10. Present payment per customer for five customers, if equally divided	50.19

Therefore, the amount of the customers' payment would be $250.97, which sum, together with interest on the balance at 5 per cent compounded annually, will in ten years pay $325 at the rate of $32.50 per year.

When the extension has been completed and the actual cost has been ascertained the customers' payment shall be recomputed. If the original payment was greater than the amount computed on the basis of actual cost the utility shall refund the difference. If the reverse be true, then the utility shall not require any additional payment from the customer.

As a result of the standard line extension policy, applicable to the entire state, yet flexible enough to fit existing local conditions, thousands of rural residents have been supplied with electric service. The number of extensions completed has steadily increased and, considering the hundreds of miles of line built each year, very few complaints are received by the department.

While such a method of financing extensions appears to be complicated upon first reading, those having to use this rule find it simple in its application.

Only one change has been deemed necessary during the past six years. Effective July 1, 1929, subsequent customers coming on the line within five years after its construction must pay their pro rata share of the extension, which share is refunded to existing customers. Prior to this date the limit was three years.

The figures essential is making this rule effective, as filed in the tariffs of the larger companies serving this state, are shown in Table I.

Most of the utilities operating under these rules limit the construction of extensions to those having an investment ratio of less than six to one. Any estimate the cost of which will exceed six times the annual gross revenue is generally referred direct to the Department of Public Works for adjustment. One of the above companies has constructed 250 miles of pole line and has added 1,783 rural customers since 1923 under these standard rules. More detailed figures showing the growth of the rural business of another company will be found in Table II.

This company averages between 400 and 500 miles of rural construction and adds approximately 6,000 rural customers to its lines annually. It reports serving 20,000 farmers whose average rate in 1928 was 5½ cents per kilowatt-hour.

According to the sixth annual report of the Committee on the Relation of Electricity to Agriculture, Washington stands first among states of the Union in the percentage of farms receiving central-station service, having 46.9 per cent of its farms electrified as of January 1, 1929.

40 per cent grades no obstacle to this cable reel carrier

Handling Reel in Mountains Easily and Cheaply

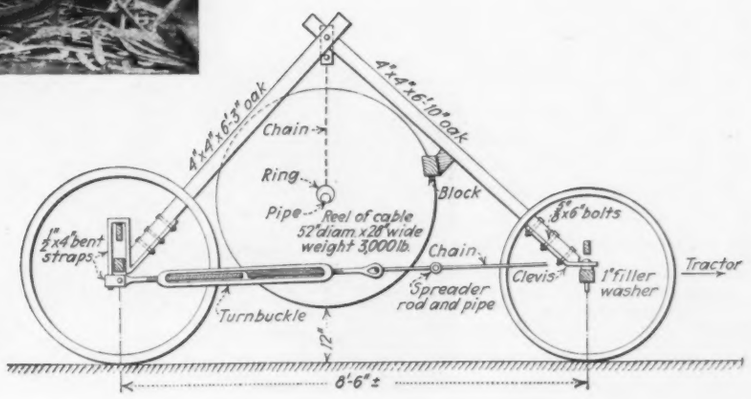
By J. ELMER HOUSLEY
Tallassee Power Company, Alcoa, Tenn.

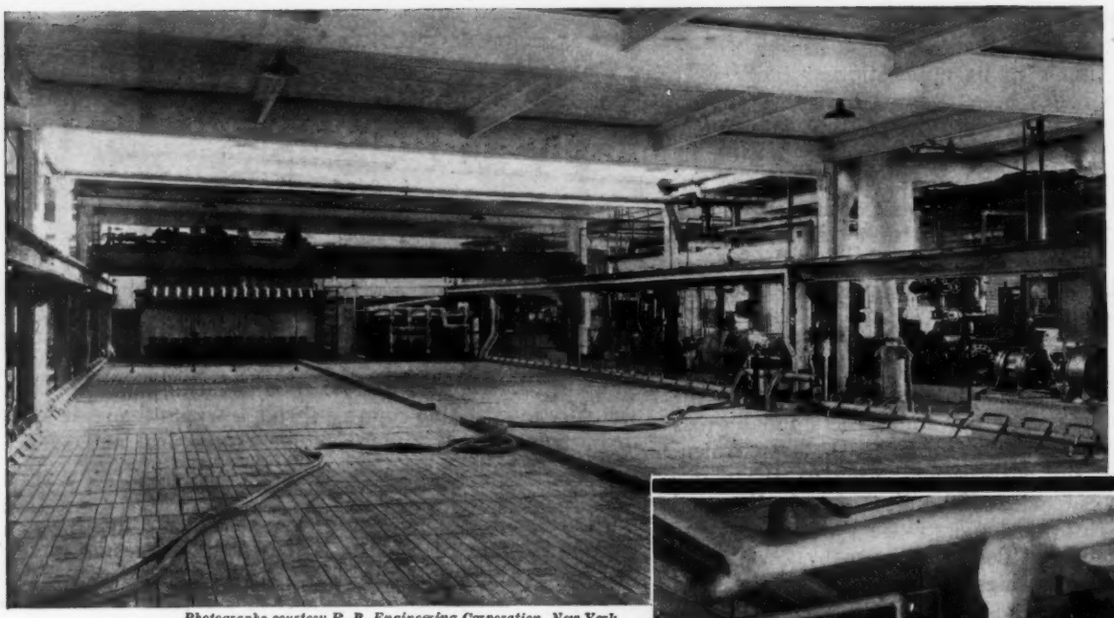
DELIVERY of cable reels, containing a total of approximately 90 miles of 500,000-cir.mil aluminum cable steel reinforced, to mountainous regions was greatly simplified by the use of two rebuilt farm wagons. The virtually inaccessible country through which the reels had to be transported rendered some economical and satisfactory expedient advisable and the rebuilt wagons did the job.

The advantages sought in the design of the wagon were low center of gravity, light weight, minimum labor in loading and unloading and ability to negotiate rough and rocky roads without damage to the reels. The reels were 60 in. in diameter and weighed 3,000 lb.

One-third of the cable was delivered over rolling country where road grades did not exceed 3 per cent and mules were used for this section, one wagon being equipped with a tongue connection in addition to the removable drawbar connection for use with a 1-ton caterpillar tractor. The other wagon was fitted with the tractor drawbar only. No brakes were provided. In the mountains grades were encountered up to 40 per cent, although those above 25 per cent were rare. A trailing Scotch-stick was fastened to the center of the rear axle to prevent backing when loaded.

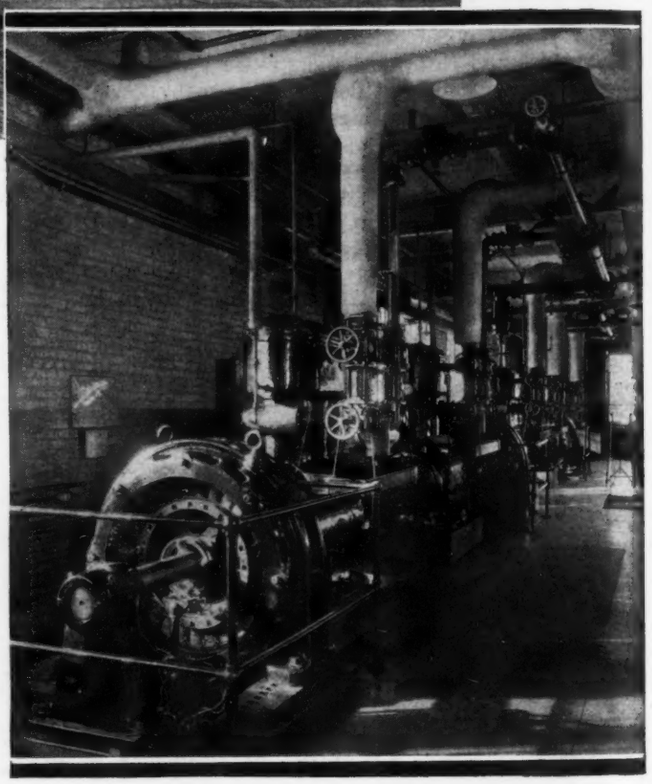
No trouble was encountered in passing over rocks in the center of the road in spite of the fact that the clearance for the reel was only 12 in. above the ground when on level terrain. The suspension was such that the load would swing back and up and at the same time roll over any obstacle without damaging the lagging on the reel. The short wheel base of only 102 in. prevented the reel from dragging while crossing humps in the road.





Multiple can pull served by electric crane

Four synchronous motors drive compressors and help maintain power factor



Photographs courtesy R. B. Engineering Corporation, New York.

Ice Made and Delivered Electrically

A LOW-PRESSURE, raw-water, ice manufacturing plant with a capacity of 225 tons per day supplements the natural ice supply of the Metropolitan Ice Company at Cambridge, Mass., energy being furnished at 2,300 volts, three phase, by the Cambridge Electric Light Company. Nine electric trucks, mainly of 3 tons capacity, form a part of the equipment which distributes this ice along some 40 routes. The compressors are driven by synchronous motors and the power factor at all times is 98 per cent or better. A plant of this type can be expected to consume from 1,500,000 kw.-hr. per year at about 40 per cent load factor to 2,750,000 at nearly 70 per cent. Even in midsummer, using a spray pond, the energy consumption of this plant is below 48 kw.-hr. per ton.

Electric ice trucks sound retreat bugle for horse-drawn wagons

Rate Function of Federal Court*

THE general tendency to take stock now of the utility regulatory machinery of both commission and court nature has precipitated the old question of the propriety of the federal review and injunction in rate cases. One aspect of the situation is the fact that the federal court is not obligated to base its decision merely on the testimony and evidence presented before the state commission. Congress will have before it a proposal to restrict the federal court review to that subject matter. In this connection a timely paper in the *Harvard Law Review* for January sets out in succinct manner the differences in philosophy and law guiding the submission of appeals to the state and federal courts and their respective limitations and powers in passing on the merits of the cases. Excerpts from this paper follow:

"A public utility has a choice of forums in which to set up its claim that its rights under the federal Constitution are being invaded. The interesting and sometimes difficult question is not whether there *is* a right to appeal to a national court, but at just what stage of the process of state regulation that appeal may be made. This requisite of timeliness was created as an original doctrine by the Supreme Court of the United States, and apparently upon the court's own initiative and without the aid of counsel."

"To conform with the demands of 'equitable fitness or propriety,' public utilities that feel that their property is being taken, or about to be taken, by an order of the state commission 'should make sure that the state in its final legislative action would not respect what they think their rights to be, before resorting to the courts of the United States.' And in that particular case the state had not taken 'its final legislative action.' The powers vested by the constitution of Virginia in the supreme court of appeals are legislative, even though exercised by a tribunal designated a court, and until this court had acted it was not 'absolutely certain that the officials of the state would try to establish and enforce an unconstitutional rule.'"

"For one with more than an academic contact with public utility regulation it is difficult to understand why it is a 'proper and orderly course' to grant a public utility immediate access to a federal court when the state courts act judicially, and to require it to spend months and years in appealing to one or perhaps two state courts before finally coming into the federal court, simply because those state courts are empowered to act legislatively. The chief reason why the exhaustion of state remedies can be said to promote an 'orderly' procedure is because of a salutary policy, to which the court subscribes, against avoidable interference with local affairs by the courts of the national government."

Relatively few confiscation cases find their way into the state courts. Corporation lawyers relish the chance to try lost cases in new fields. Federal injunction unaffected by popular pressure

"The requirement that federal relief must wait upon the issuance of a commission order (except in the rare case of an unreasonable delay) has been adhered to even though the final result of the commission's continuing deliberations will certainly fail to give the utility the relief to which it claims it is entitled as a matter of constitutional right."

"Still another aspect is presented when the commission, conducting an investigation as to the reasonableness of rates, is not ready to issue an order determining the main issue, but does authorize certain temporary rates, to be charged only for a limited time, or until the completion of the main investigation. The Supreme Court upheld a decree enjoining the enforcement of a schedule of reduced telephone rates, effective by the terms of the order only until the commission had completed an extensive investigation of telephone rates, upon which it planned to base an order fixing 'permanent' rates."

"It is conceivable that two appeals from the same commission order will be presecuted at the same time—one in the state courts and one in the federal courts. These may be at the suit of the same party, or of different ones, as where an intervenor appeals to the state courts, and the public utility seeks to enjoin the same order in the federal court. If the state supreme court upholds the order before the federal court has held its final hearing, that judgment would conclude the federal court if the public utility had taken both appeals. Would the same result follow if the state appeal was at the instance of an intervenor? Upon this question there is no authority, and the question seems a close one."

"Under the state statutes providing for review, it is almost uniformly set out that unless an order of the commission is appealed from within a certain time following its issuance, such order shall become final. These provisions are similar to those regularly found in the procedural statutes limiting the time for appeals from

**Excerpts from an article by David E. Lilienthal in "Harvard Law Review," January, 1930.*

the judgments or decrees of lower courts. The validity of such statutes is unquestioned, if the period fixed is reasonable. . . . Since there is no federal statute or rule of court imposing a time limit, the result is that a commission order is never beyond review in the federal courts, if a constitutional question is involved."

"The court should, and usually does, grant a city's petition to intervene; where a rate order affects the consumers in a large city, the brunt of the task of defending the order is usually carried by the city's counsel and experts. While the Attorney-General and perhaps other enforcement officers may or should be made parties defendant, the state is not a necessary party, and is not the real party in interest."

"The commission's findings of fact can have no binding effect upon the federal court in a confiscation proceeding; that court must exercise its own independent judgment. But from this it does not follow that the federal court need give the commission's findings no weight; on the contrary, the presumption is that the commission has acted fairly and the burden of establishing the contrary is always upon the complainant."

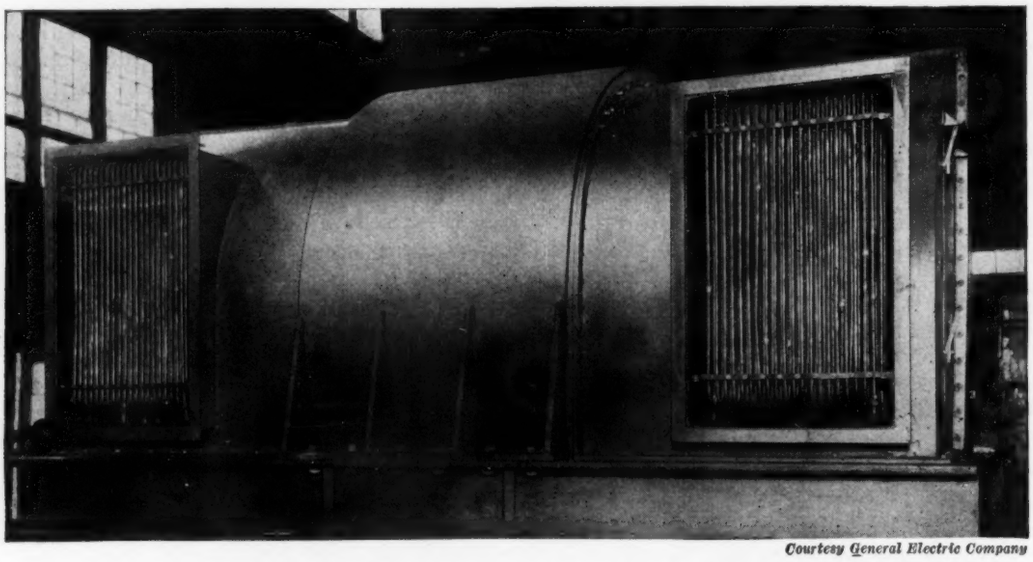
"A federal court is, of course, endowed only with judicial powers. Accordingly, the function of its decree is simply to determine present rights between the parties, and not to fix a rule for the future. A decree enjoining the enforcement of city-made rates as confiscatory, conditioned upon the distribution of all sums exacted in excess of whatever rate 'might be fixed thereafter by competent state authority,' is beyond the court's powers, for 'rate making is no function of the courts, and should not be attempted, either directly or indirectly.' For the same reason, the courts by their decrees 'are not authorized to revise or change the body of rates imposed by a legislature or a commission; . . . (nor to) determine whether one rate is preferable to another . . . ; they do not engage in any mere administrative work,' such as the determination of what will constitute reasonable rates or reasonable service."

"It is a significant characteristic of the review afforded by the state courts that the procedure is a review not of the lawfulness of the commission's order in general, but of its validity upon the particular record made before the commission. It is therefore a review closely analogous in several respects to that afforded upon writ of error from the judgment of a trial court. Upon the filing of the petition for judicial review it becomes the duty of the commission to certify to the reviewing court the record of the proceeding had before it, upon which it based its order. It is upon the basis of the facts put into evidence before the commission, and the findings of the commission based upon these facts, that the state courts must judge the validity of the commission order. Statutes forbidding the reviewing court from considering other and additional evidence are common, and their validity under the federal Constitution has been upheld."

"The most outstanding difference is in the record upon which the reviewing courts base their conclusion as to the validity of the order. If the same commission order were under review in both a state and a federal court it is conceivable and even likely that the two courts would have wholly different records before them."

"The scope of relief possible in the state courts is narrower than is available in the federal courts. For all the state courts are empowered to do, except those which act legislatively, is to affirm or set aside the commission's

AIR-COOLED BEARING OIL AVOIDS COLD WEATHER HAZARDS



Courtesy General Electric Company

Coolers placed in the incoming air stream of this 15,000-kw., 11,500-volt, 900-r.p.m. synchronous condenser enable careful control of bearing oil temperature without water cooling. This equipment is designed for outdoor use. Air is taken through filters from the outside and discharged through the base of the machine. The warm discharge air may be diverted to heat near-by buildings. Sufficient air may be recirculated inside housing to maintain a proper operating temperature in cold weather

order, and remand the matter to the commission for further proceedings. Where the commission order reduces the company's rates from those previously charged, then of course the scope of relief afforded by a stay of such an order is amply broad. But suppose the utility has applied for an increase in rates. A stay of this order would not permit the company to charge increased rates. There is cold comfort for a utility in a victory in the state supreme court if all that court may hold is that the commission's three-year-old order denying the increase in rates was unlawful and should be set aside. During the period of the appeal the utility was suffering from an unlawful order, and for the consequent loss there is no way by which it can be reimbursed. With its hard-fought victory in hand it must then return to the commission, and again demand relief. And while the supreme court decision is authoritative as of the date of the commission's order, economic or social conditions may have so changed in the interim that the commission, exercising an honest and informed judgment, may conclude at once that more relief should be denied."

"No such limitations upon comprehensive and complete relief seem to hamper the federal judiciary. The federal court may, of course, simply declare the commission's order fixing rates confiscatory and unconstitutional and enjoin its enforcement, a decree corresponding to that of a state reviewing court. But the federal courts may properly go much further: the commission may be enjoined from interfering with the company's putting into effect schedules of increased rates, rates under existing schedules having been found by the court to be confiscatory. And though it is our opinion that such decrees are beyond their powers, we have pointed out the practice of approving decrees giving relief even more comprehensive, by laying down a rule to bind the commission in future rate deliberations."

▼ ▼ ▼

Crane Speeds Construction and Reduces Costs

LIGHT-WEIGHT, revolving, tractor-mounted cranes have proved to be efficient means of speeding work and reducing costs for much underground electrical construction. According to the experience of the Brooklyn Edison Company, in trench excavation, manhole construction and pole setting such cranes have reduced the number of workmen, have cut the time required for certain operations and have freed other equipment for more profitable uses.

After the concrete for manholes has been poured and set the inside forms are removed and the 2-in. plank sheeting is pulled. By old methods, using a lever and man-power, the removal of the sheeting was a four-hour job for eight or ten men. The crane does the same work in 35 minutes with two men.

After pulling the sheeting, the crane lifts the two reinforced concrete slab covers, weighing about 3,200 lb. each, from a truck and places them over the manhole. With the slabs in place, it lifts the transformers up to and including 150 kva. from the truck and lowers them through the manhole opening.

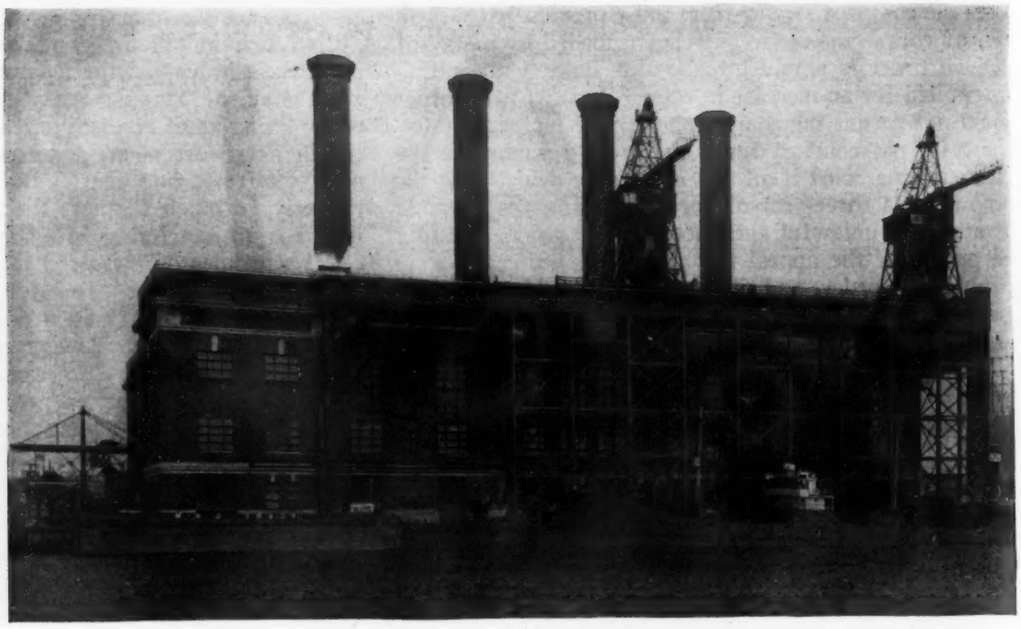
The cranes render another important service in setting ornamental lighting standards. When the concrete base for the pole is poured a greased pipe is left in the concrete to form the hole in which the stem at the bottom of the pole is set. The first duty of the crane upon its arrival is to pull this pipe. The crane then unloads the pole from a truck and sets it on the base. The small size, mobility and flexibility of the device are particularly advantageous in this class of work where heavy traffic, congested streets, overhead wires and elevated structures obstruct the movement of larger machines. An operator and two men are required in setting lamp poles.

Large boulders up to 3,500 lb. encountered in excavating trenches formerly delayed the work and demanded a special trip from the company's yard to a truck-mounted air compressor with tools to break up the rock. The cranes in their daily routine now take care of these boulders, lifting them from the excavation and loading them on trucks.

An efficient dispatching system is employed to get full use of the cranes in their daily movements about the city. The effect of this system, combined with the mobility and versatility of the crane, can be seen in the following typical day's work for one of the machines:

Location	Operation	Time, Hours
1	Lowered two transformers	1½
2	Set lamp poles	2½
3	Shifted lamp poles	½
4	Removed lamp poles	1½
5	Lowered three transformers	1
6	Lowered three transformers	1½

The distance covered between jobs on this day was more than 16 miles. The Brooklyn Edison Company uses three of these Frederic H. Poor, Inc., "Loadmaster" cranes for these various services.



Hell Gate Station Design

By W. E. CALDWELL

Research Engineer
The United Electric Light & Power Company,
New York

IN THE Hell Gate station addition of two 160,000-kw. turbo-generator units discussed in last week's issue of ELECTRICAL WORLD there arose the problem of getting sufficient boiler capacity. This was done by installing new boilers in the space available and by increasing the capacity of old boilers already installed.

In order to provide part of the additional steam for Nos. 8 and 9 units three boilers have been installed in the remaining space available in the boiler room and designed to deliver just as much capacity as possible consistent with economy from the space available.

These boilers have a nominal rating of 2,400 hp., including water-cooled walls on all four sides, and are fired by pulverized fuel and unit mills using the tangential method of firing. The boilers are provided with both economizers and air heaters, the two being arranged in parallel due to space limitations, to lessen draft resistance, and provide temperature control on the preheater. Since mill drying is the only means employed to insure mill capacity when milling wet coal adequate temperature control becomes important under such conditions. This arrangement of economizer and air heater was necessary to overcome both thermal and structural limitations incident to the design. The width between columns and wall was insufficient to provide an economizer in which the draft resistance would be low enough for a proper economic balance with induced draft fan power. By installing the air heater on the boiler side of the columns it was possible to divert gas up between the boiler drums and relieve the economizer of part of the gas. Furthermore, as much boiler surface had been installed as economics and space warranted and at the maximum rating it was expected that boiler exit temperatures would be in the neighborhood of 825 deg. Such a temperature would cause steaming in the economizer at high ratings if the gas temperature were lowered sufficiently through this one heat absorber to produce satisfactory over-all efficiency. Therefore, relieving the economizer of part of this gas permitted a much more economic disposition of the remaining hot gas at a better efficiency and with increased safety.

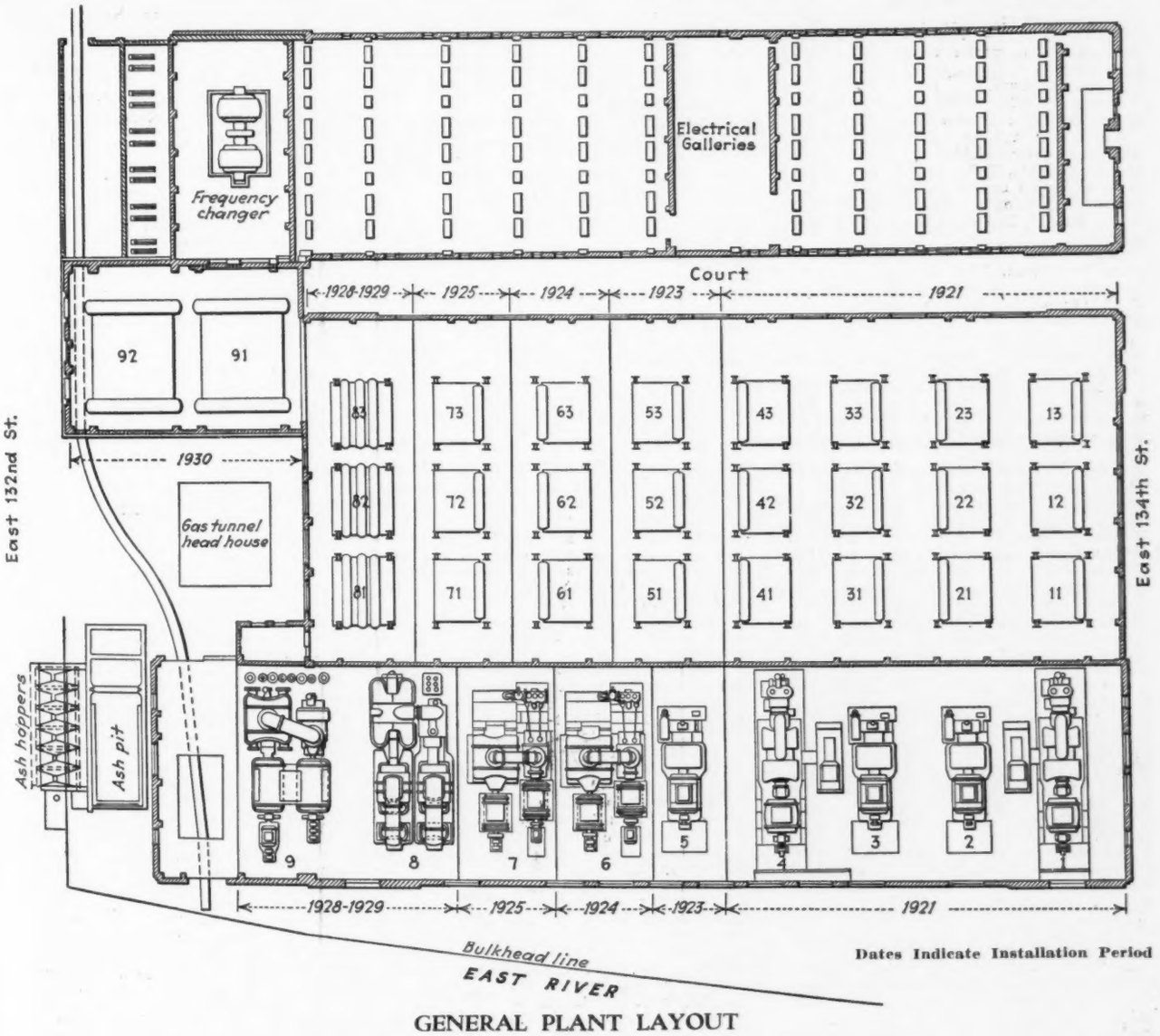
A value of 825 deg. has been set as the limiting boiler exit temperature, since this is about the highest temperature that seems satisfactory for use with air heaters. Studies had been made of the possibility of structural changes which would permit the installation of the air heater and economizer in series. These, however, did not seem satisfactory with the air heater between the

economizer and boiler. Means of controlling the air temperature did not appear satisfactory and the possibility of difficulty arising from this source appeared probable. With the air heater installed after the economizer it appeared that difficulties might arise on account of the air temperature being insufficient, especially when high CO_2 is carried in the furnace. That is, with low excess air in the flue gas the economizer and boiler would absorb practically all of the heat and the air heater become useless. Under such conditions serious sweating of the air heater plates would take place at low ratings, resulting in excessive maintenance and consequent loss of boiler availability during maintenance periods.

By means of the air heater arranged in parallel with the economizer it is possible to operate the unit at a very low rating without danger of sweating of the air heater plates. Obviously, at practically any rating the outlet gas from the air heater may be maintained above the dew point. The economizer itself is protected against sweating and external tube corrosion by controlling the temperature of the feedwater entering the economizer. Thus at any rating at which it is desired to operate the

EXTENSIONS to existing power stations involve many engineering and economic considerations, yet it is economical to build power plants by the increment addition method. Thus the original design must take into consideration future needs and changes in the art and equipment.

IT IS a fundamental factor to get station investment charges to a minimum by using the largest unit equipment. The principles involved in the Hell Gate additions are applicable to large and small stations.



GENERAL PLANT LAYOUT

unit the gases leaving the air heater and economizer may be maintained above the dew point, avoiding the corrosion and consequent maintenance which would otherwise result.

The boiler is provided with three drums in order to stabilize the water level and provide connections for the water wall down-comers and up-takes as well as the connections to the boiler proper and superheater.

Due to the large amount of heating surface and the rapid circulation which results from pulverized fuel firing and water wall cooling it was felt that large drum capacity would be desirable to stabilize the water level and insure reliable operation of the boiler without very close attention.

The saturated steam connections are taken from the center drum by means of three 10-in. nozzles. The nipples connecting this set of drums with the other drums and down-comers were so proportioned that the water level in the center drum is always a few inches below that in the other drums. This gives an effect somewhat akin to a dry drum, but at the same time providing additional capacity to take care of expansion of the water in the boiler incident to an increase in the rate of driving. Limitations imposed by existing building columns necessitated high gas velocities at entrance into the tube bank and caused some speculation concerning the possible effect on slag accumulations. Experience indicated that slagging of the lower boiler tubes is aggravated by

DATA ON 1928-1929 INSTALLATIONS AT HELL GATE

Structures

Turbine room extension—Length, 70 ft.; width, 100 ft.; height, 124 ft.

Boilers, Superheaters, Economizers, and Air Preheaters

Make of boilers—Springfield.

Firing—Pulverized fuel.

Type of boilers—Cross drum, water tube, three-pass with water walls; three drums per boiler.

Number—Three.

Width of firing aisle, 24 ft.; center of groups, 46 ft.; side aisle, 9 ft. 9 in.

Areas and volumes per boiler—Water-heating surface, 20,000 sq.ft.; water-wall-heating surface, 3,800 sq.ft.; total heating surface, 23,800 sq.ft.; superheater surface, 4,800 sq.ft.; furnace volumes, No. 81, 18,800 cu.ft.; No. 82, 21,840 cu.ft.; No. 83, 18,150 cu.ft.

Ratios—Water-heating surface to boiler-room floor area, 7.56; furnace volume to water-heating surface, No. 81, 0.79; No. 82, 0.918; No. 83, 0.763, super-heating surface to total water heating surface, 0.202.

Size of boiler tubes—Diameter (outside), 3 in.; length, 20 ft.; thickness, No. 9, gage.

Boiler pressure—275 lb. gage.

Make of superheaters—Superheater Company, Elesco, bent tube, convection type. Make of water-cooled walls, Combustion Engineering Company. Type of water walls, fin.

Economizer Data—Make, No. 81 and No. 82, Foster Wheeler Corporation; No. 83, Combustion Engineering. Type, No. 81 and No. 82, Foster; No. 83, C. E. C. fin tube. Number—One per boiler.

Square-feet heating surface—No. 81 and No. 82, 26,136 (22 rows high, 18 rows wide, 22 ft. 0 in. long over rings); No. 83, 27,836 (56 rows high in two sections, 18 rows wide, 21 ft. 0 in. length of tubes).

Ratio economizer surface to boiler surface—No. 81 and No. 82, 1.1 to 1; No. 83, 1.17 to 1.

Air Preheater Data—Make, Combustion Engineering Company, plate, oil boiler. Surface, 11,840 sq.ft. Capacity, 456,700 lb. air per hour. Operation, parallel with economizer. Temperature regulated by damper control. Temperatures, air, inlet, 70 deg.; outlet, 286 deg.; gas, inlet, 820 deg.; outlet, 484 deg.

Type of boiler setting—Suspended boiler with plaster setting.

Construction of setting — Water-cooled furnace walls insulated with 1¾-in. Silocel, 4-in. Weber's No. 48 plaster, finished with ½-in. hard cement.

Combustion Equipment

Make, Combustion Engineering Company.

Fuel Preparation and Burning—Preparation, unit system; type drier, mill drying; mills, Raymond Impact No. 82, four per boiler, 12,500 lb. per hour each. Burners, tangent, three elements per burner, four burners per boiler, one burner per mill. Air supply, primary, 15 per cent of total, introduced at mill at 280 deg.; secondary, 85 per cent of total, introduced at burner at 280 deg. Ash disposal, furnace, hydraulic; flue gas, hydraulic.

Fans

Induced Draft Fan Data—Make, Sturtevant, one per boiler. Capacity, 275,000 c.f.m., 14 in. s.p. Fan drive, motor drive, 1,200 hp., Westinghouse, 870, 690, 435 r.p.m., 2,300 volt.

Forced Draft Fan Data—Make of fan, Sturtevant, one per boiler. Capacity (each), 155,000 c.f.m., 10 in. s.p. Fan drive, motor drive, 400 hp., Westinghouse, 870, 690, 435 r.p.m., 2,300 volt.

Coal Handling

Equipment — Two magnetic steel apron feeder conveyors, Link Belt Company. Two automatic recording scales, Richardson Scale Company. Two spiral conveyors, Link Belt Company.

Procedure—Equipment installed in two parallel systems with a capacity of 50 tons each of raw coal per hour. The coal is taken from a 400-ton receiving bunker, weighed and conveyed to 100-ton capacity bunkers in front of each boiler, from which it is delivered to the unit mills.

Prime Movers

Unit No. 8 — American Brown Boveri, cross-compound. Rated capacity, 75,000 kw. high-pressure section, 85,000 kw. low-pressure section. Speed, 1,800 r.p.m. high-pressure section, 1,200 r.p.m. low-pressure section. Blading, reaction, stainless steel, tapered. Bleed points, two. Purpose of bleeding, feedwater heating.

Type of Generator — Three phase, 60 cycle, 13,800 volts. Rating, 88,250 kva. high-pressure section, 100,000 kva. low-pressure section. Ventilation—closed-type system, extended surface cooler, two blowers, one on each main shaft, 264,500 c.f.m. Excitation—Two direct-connected exciters, 270 kw., 300 volts high-pressure shaft; 310 kw., 300 volts low-pressure shaft.

Lubrication—Four oil coolers in series, rotary gear type oil pump, standby turbine-driven centrifugal oil pump. Weights—Turbine, 28 tons high-pressure rotor, 100 tons low-pressure rotor, total 730 tons; generator, 66 tons high-pressure rotor, 110 tons low-pressure rotor.

No house generator.

Unit No. 9 — Westinghouse, cross-compound. Rated capacity, 80,000 kw. for both high- and low-pressure sections. Speed, 1,800 r.p.m. for both high- and low-pressure sections. Blading, reaction, stainless steel, tapered. Bleed points, two. Purpose of bleeding, feedwater heating.

Type of Generator — Three phase, 60 cycle, 13,800 volts. Rating, 94,200 kva. for both high- and low-pressure section. Ventilation—Closed-type system, extended surface cooler, three motor-driven blowers, 91,667 c.f.m. each. Excitation—Two direct-connected exciters on high-pressure shaft, each 200 kw., 250 volts.

Lubrication—Griscom & Russell oil coolers, direct-connected oil pumps, standby turbine-driven oil pump. Weights—Turbine, 50 tons high-pressure rotor, 80 tons low-pressure rotor, total 673 tons; generator, 99 tons each for high-pressure and low-pressure rotors.

House generator—One 6,250 kva., three-phase, 2,400 volts, direct connected to low-pressure shaft.

Condensers

Units Nos. 8 and 9 — Make, Westinghouse; type, double two-pass, radial type, surface condenser; tube surface, 137,500 sq.ft.; tubes, 32,000 ¾-in. o.d. No. 18 Admiralty; square feet tube surface per rated kilowatt of prime mover, 0.86.

Circulating Pump Data — Number per condenser, two; make, Westinghouse; capacity (each), 77,500 g.p.m.; drive, direct-connected 500/190 hp., 40-deg. motor, type "C8," 2,300 volt, three phase, 60 cycles, 290/217 r.p.m.; capacity per kilowatts installed, 0.97 g.p.m. per kilowatt.

Hot-Well Pump Data—Number per condenser, three; make, Westinghouse; type, three-stage, steam jet air ejectors; capacity, 64 c.f.m. at 29.5 in. vacuum.

Boiler Feed Pumps

Unit No. 8—Two Bethlehem, weir type, horizontal, single suction, single stage, turbine drive; capacity, 2,000 g.p.m. of 210 deg. F. water at 3,600 r.p.m. and 500 lb. per square inch discharge pressure.

Unit No. 9—Two Dean Hill, two-stage, diffuser type, turbine drive; capacity, 2,000 g.p.m. of 210 deg. F. water at 2,800 r.p.m. and 500 lb. per square inch discharge pressure.

Feedwater Heaters

Unit No. 8—Two Elliott Company cylindrical, closed, floating head type. Surface, 5,900 sq.ft. for both high- and low-pressure heaters. Tubes, ¾-in. o.d.; capacity at 160,000 kw., low-pressure heater 1,690,000 lb. per hour, high-pressure heater 1,880,000 lb. per hour.

Unit No. 9—Two Cochrane, cylindrical, closed, floating head type. Surface, low-pressure heater 5,400 sq.ft., high-pressure heater 4,350 sq.ft. Tubes, ¾-in. o.d. Capacity at 160,000 kw., low-pressure heater, 1,497,700 lb. per hour, high-pressure heater, 1,705,000 lb. per hour.

entrance velocities around 60 ft. or more per second and in some installations slag difficulties have determined the limit of boiler capacity before other limits were reached.

In these boilers this velocity is exceeded at the maximum rating, but it was felt that serious slag accumulation in the boiler tubes would be improbable due to the presence of the completely water-cooled combustion chamber, of a type on which information was not available as to the relation between gas velocities and slagging tendencies. As a precaution, however, clean-out openings have been provided below the boiler headers so that in the event of slagging it may be removed from the tube bank by means of slice bars, without the necessity of taking the boiler out of service. In the design of boiler and water walls space has been provided for the installation of a slag screen below the bottom boiler tubes later in case conditions warrant it. However, several months' operating experience with these boilers, using a wide variety of coals, indicates that no unusual trouble should be expected from slagging of the boiler tubes.

Unit type pulverizing mills and molten-slag removal

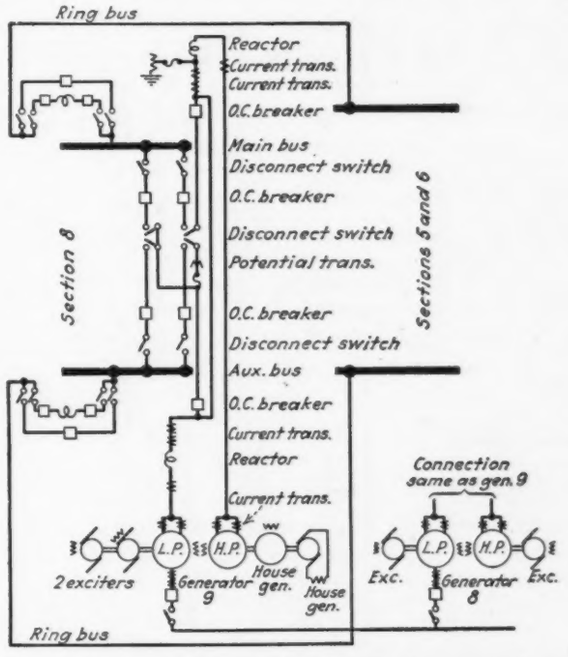
Each boiler is equipped with four unit mills having a capacity of 12,500 lb. of coal per hour. Each mill receives preheated air from the forced draft duct and delivers the pulverized coal and primary air to a burner at one corner of the furnace. The preheated secondary air enters around, above and below the pulverized fuel and primary air. The four corner burners discharge at an angle which forms a tangent to an imaginary circle in the center of the furnace. Two of the boiler furnaces are equipped with inclined ash hoppers of the conventional dry bottom type, one of which is provided with a water screen, while ash from the remaining boiler furnace is handled in a molten condition. While it is felt that a water screen may not be required, sufficient information was not available at the time these boilers were designed to decide this question definitely.

At a maximum rating of about 400,000 lb. of steam per hour there will be a heat release of about 32,000 B.t.u.'s per cubic feet of furnace volume per hour.

Coal for the unit mills is received from an overhead bunker, to which it is delivered from the main bunker by a screw conveyor after passing through an automatic scale and magnetic separator. The forced and induced draft fans are provided with vane control and driven by three-speed induction motors. The boiler is equipped with an interdeck superheater designed for 750 deg. steam temperature. Ashes are delivered by a hydraulic sluice to the existing system and receiving pit, which was pioneered in this plant at the time of the initial development.

While the installation of the three pulverized fuel boilers combined, together with the existing boilers in the plant, met the immediate requirements for steam, additional capacity is required to develop the full generator capacity of the station. A comprehensive program has been worked out to supply this steam in increments required by the growth of the system. Very little space is available within economic distance of the plant to develop the required capacity in a new installation, but as much capacity will be developed as the remaining space available will permit, and it was found necessary to make up the remaining deficiency by increasing the capacity of the older boilers.

For the new installation two complete new boilers with economizers, air heaters, pulverizing mills and auxiliaries have been purchased for installation in an addition to the boiler room on the south end. Each of these boiler units will have a continuous capacity of 800,000 lb. of steam per hour, which will practically meet the steam requirements of No. 9 unit when both of these boilers are in service. These boilers will be fired by unit mills and the ash will be handled in the molten condition. A new stack will be erected for these boilers and apparatus will be installed for the elimination of fly ash The increase in capacity of the older boilers is being



General arrangement of electrical connections for units Nos. 8 and 9

accomplished by the substitution of larger stokers, water walls and other changes found necessary to develop the maximum economic capacity. Various improvements are being made to bring the design of the older boiler units into more perfect harmony, aided by a background of experience in their operation. By this means it is expected that in addition to the increase in capacity the efficiency will be also increased and the maintenance reduced.

Structural problems

With the extension of the turbine room it was necessary to make provision for supporting the coal track scales and cable road located above the crane rails while this work was in progress. Originally, the coal track and scales were supported by the columns in the end wall, consequently the removal of this wall necessitated new steel framing to support the track and scales. The structural changes had to proceed without interruption to the station coal supply except for short periods of time when the station bunkers were full.

A sheet metal inside wall secured to the steel work of the original end wall was erected before the demolition

of the masonry work was started. The work on new framing for supporting the coal track progressed as operating conditions would permit and when sufficiently advanced the demolition of the masonry work started. In the meantime foundation work and structural steel for the extension was started. After the extension had been closed in the steel and sheet metal bulkhead carried inside the old wall was removed.

With the extension of the turbine room it also became necessary to relocate the ash receiving pit and to provide temporary means for ash disposal while this work was in progress. A temporary pit was provided on vacant property across 132d Street from the plant and a temporary covered flume of wood was extended from a branch in the original sluice line to the new receiving pit. The refuse which collected in the receiving pit was handled to stock pile or trucks by means of gasoline crane and clamshell bucket. Minor difficulties were experienced with this temporary expedient, but it served the purpose very well until the permanent pit could be provided.

Hell Gate Plant Ratios

	Area — Sq.Ft. per Kw.		
	Original Units 1-4	Recent Units 8-9	Completed Station
Turbine room	0.113	0.029	0.069
Boiler room	0.175	0.071	0.105
Boilers and turbines	0.288	0.100	0.174
Electrical galleries	0.149	0.070	0.074
Total	0.437	0.170	0.248
	Volume — Cu.Ft. per Kw.		
	Original Units 1-4	Recent Units 8-9	Completed Station
Turbine room	14.0	3.83	8.71
Boiler room	21.7	9.72	13.55
Boilers and turbines	35.7	13.55	22.26
Electrical galleries	17.0	8.00	8.39
Total	52.7	21.55	30.65

The permanent pit and rehandling equipment is located just beyond the turbine room extension and in its design various improvements were incorporated which were found desirable from experience with the earlier pit. The construction work on this pit was carried along with the foundations for the new building, which rendered the operations very economical from a material handling and contracting standpoint.

The erection of the induced-draft fan parts introduced some structural problems, but these were overcome initially by arranging the sequence of the installation so that the opening of entry was not closed until the last fan was installed. With the last fan installed, however, it would be impossible to remove the rotors from the preceding fans for repair or replacement. Such a condition is, of course, objectionable, and especially so in a pulverized fuel plant, inasmuch as replacement of fan impellers and other wearing parts becomes necessary quite frequently due to abrasion. To provide for this condition, hatches were made in the roof with removable covers of a size sufficient to handle the largest part. While the hatch openings are large enough to remove the shaft and impeller in a single operation, provision has been made to remove the impeller from the shaft in a vertical position between the fans, after which the impeller may be more easily replaced. The sizes of these parts are quite large compared with earlier practice with older boilers; that is, the impeller is 8 ft. in diameter and the shaft length is 22 ft., which, with the corresponding weight, renders this a rather difficult problem of handling from a maintenance standpoint.

The problem of providing for the economic maintenance of these fans was further complicated by the fact that the main coal track is located immediately above the fans. As a result of this condition it was necessary to mount the coal tracks on the hatch cover so that they would be removed as a unit with the cover at such times as the necessity for opening the hatch arises.

Provision has been made for the installation later of a monorail system above these hatches elevated above roof level for handling these parts in the event that it is found to be justified by the frequency of replacements and economic considerations.

Conclusion

The accompanying ratios reflect the structural savings rendered possible by a far-sighted policy in the selection of large units. Contrasted with the combined economies made possible by the choice of large units building savings become merely incidental. When the plant ratios are considered as comparative measures of investment efficiency, however, the physical factors given in the table become far more significant.

In the absence of capacity limits on the size of generating units established by system load or other uncontrollable influences a simple mathematical analysis indicates that the largest available units should be employed to obtain the maximum return on the investment. With metropolitan stations the choice of compact units of high capacity becomes even more essential in achieving the utmost efficiency in the use of the site and operating personnel. In the case of Hell Gate station successive additions to capacity followed the advances in machine design very closely and in many instances set the pace for the manufacturers.

There is no other station, perhaps, in which the advances in the art during the past decade are more strikingly illustrated. It is noteworthy that the most recent units were installed without disturbing the architectural harmony of the structures which were designed for the initial installation.

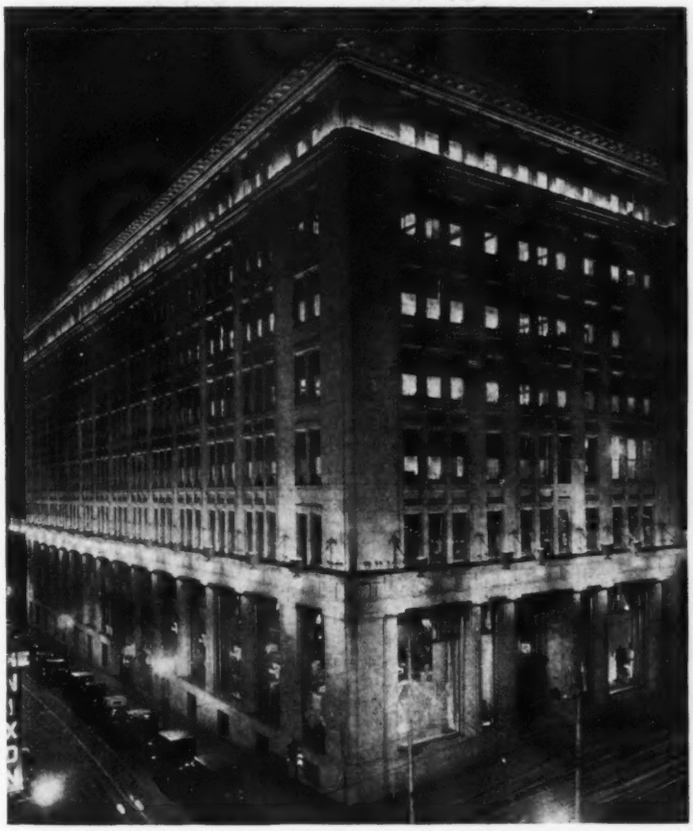
Because of the location of the station and nature of load the physical size of the buildings is greater than might be required by a more remote location. The electrical galleries are relatively large, since it is more economical to distribute the output directly through a large number of outgoing feeders. The height of the turbine room was dictated by architectural considerations and is greater than necessary for operation or maintenance. Regardless of these considerations the relation of building volume to installed capacity is very favorable. Quite aside from structural savings a dominant factor in the choice of high capacity equipment was the desire to maintain the investment and operating costs at the lowest possible point, consistent with reliability.

The writer gratefully acknowledges the aid given by his associates and the manufacturers, whose contributions were helpful in the preparation of this article.

Novel Bracket Type Floodlighting

By H. L. JOHNSTON
Duquesne Light Company, Pittsburgh, Pa.

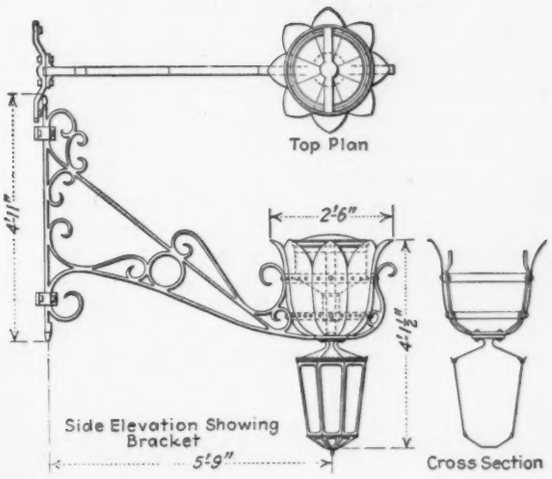
A NEW type of floodlighting system particularly applicable to buildings having a single elevation has recently been completed for the main offices of the Duquesne Light Company. Heretofore those buildings



Bracket floodlighting scheme eliminates projectors across the street

not having the set-back type of construction required one or more points of illumination, usually located across the street and on other property. This entails considerable initial cost, as well as an increased annual charge for maintenance not involved when the central service on the property may be used.

The installation is composed of 25 ornamental brackets, mounted at the third floor level. They are located on the two street sides of the building, with one located on each of the main pilasters. Each bracket contains one 1,500-watt projector, directed upward,

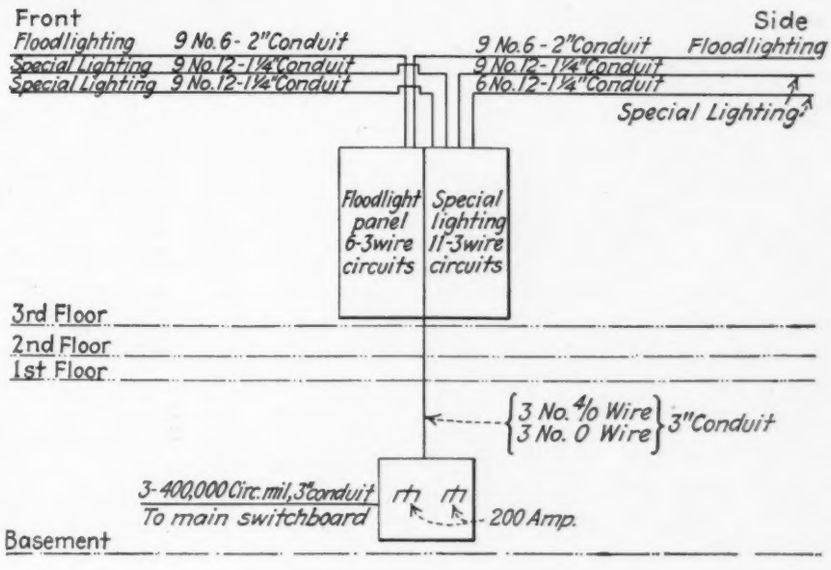


Brackets and lamp units of cast aluminum are light in weight and easy to maintain

and a 500-watt projector, directed downward. The lower units supply general illumination over the lower portion of the building and the sidewalk. The upper units illuminate the pilasters and the under sides of the sub-cornice. The upper floor and main cornice are solidly illuminated by auxiliary equipment mounted on the sub-cornice.

Each bracket supports a cast lotos flower, which houses the upper floodlight projectors. A lantern is suspended from the bracket and contains the lower projector. The bracket is hinged to the wall and may be serviced from the windows of the building. All metal parts, including the bolts to the building, are of architectural aluminum, used because of the light weight and resistance to atmospheric corrosion. This material also eliminates

Wiring planned for flood and special decorative lighting of Duquesne Light Company Building



the necessity of painting and discoloration of the building by rust stains.

Another feature of the building is the provision made for special decorative lighting for Christmas and other festive occasions when special illumination is desired. For this service additional circuits with 28 special waterproof outlets have been provided. These outlets are placed along the third floor sub-cornice and at the base of each pilaster on the first floor level. The wiring diagram outlines in more detail the dual wiring facilities made for this floodlighting and special decorations.

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Electric Heat Economical for Isolated Offices

SMALL, isolated office rooms in industrial plants power stations or substations may often be heated economically by electricity since little investment for equipment is required and hazardous expedients or non-uniform results are avoided. In one case 16 kw.-hr. per square foot of wall space and 8 kw.-hr. per cubic foot of volume were required to heat two isolated offices during a heating season of six months.

At the Cambridge (Ohio) substation of the American

Heating Requirements for Small Office

Month Ending	Average Outside Temperature F.	Average Inside Temperature F.	Kw.-Hr. per Month
12-22-28	Connected	..	...
12-31-28 (nine days)	35	70	753
1-31-29	27	70	2,978
2-28-29	27	70	2,752
3-31-29	44	70	1,668
4-30-29	54	70	663
5-31-29	60	70	484
6- 9-29 (nine days)	66	70	56
Total for season			9,354

The 2-kw. heaters cost $20 each.
The 1-kw. heater cost $14.

Gas & Electric Company, inasmuch as it was not considered necessary to heat the entire building, an operators' room was built having one side in common with the building. The walls are of hollow tile construction with the exception of the outside wall, which is brick. The dimensions are 8x11x9¼ ft. and there are three windows, each having a storm sash.

Three 2-kw., 220-volt heaters, each equipped with three-heat switch, offer ample capacity to heat the room to 70 deg. F. under the most severe weather conditions experienced in this location, according to R. H. Anders, power engineer. The lowest temperature recorded during the 1928-29 heating season was 4 below at 4 a.m. on January 14, 1929, at which time the inside temperature was 70 deg. F. At this time 5 kw. of heater capacity was used for a few hours.

In addition to heating the operators' room, there is a wash room of the same construction as the operators' room, 5½x6¼x9¾ ft. This room has a 1-kw. heater. Aside from comfort, this heater is necessary to keep the water pipes from freezing.

BOOK REVIEWS

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Die Asynchronen Drehstrommaschinen

By Dipl.-Ing. Franz Sallinger. Berlin: Julius Springer. 197 pages, 159 illustrations.

The author, professor in the school for machine construction at Esslingen, presents a relatively simple and very readable textbook on asynchronous machines, both with or without commutator, functioning either as motor or as generator. The polyphase commutating machine seems to have found somewhat wider application, or at least it has a more prominent place in technical literature, abroad than in the United States. Thus, more than a third of the book under discussion is devoted to it, the treatment here being in the main qualitative and explanatory, rather than mathematical.

* * * *

Beginnings of Telephony

By Frederich Deland Rhodes. New York: Harper & Brothers. 261 pages, illustrated. Price, $4.

This book records the history of the telephone. It should be very valuable to inventors, lawyers, students of our patent system and those who are interested in the development of an industry from the pioneering days to a commercial stage. The history of the long patent litigations is recorded by the author as part of the logical development of the art of telephony. It does not cover the technical aspects of modern telephony, but carries the historical approach up to a stage where the business was a going and stabilized branch of the industry.

* * * *

Fundamentals of Radio

By R. R. Ramsey. Bloomington, Ind.: Ramsey Publishing Company. 369 pages, illustrated. Price, $3.50.

This text covers the basic theory of radio and is designed for college courses. Accent is placed on the resonant circuit and the vacuum tube as the foundations of the radio art. Elements of electricity, batteries, measurements, detectors, transmission, vacuum tubes, radio telephone, loud speakers, receivers, amplifiers, rectifiers and amplification are some of the itemized topics whose principles are discussed and theory developed. The book is not extremely technical nor is it filled with mathematics. It is beyond the practical radio text and something less than a thorough treatise. It should serve a useful purpose for many first courses given in colleges.

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Book Note

DAS MUELHEIMER WERK DER SIEMENS-SCHUCKERTWERKE. Berlin: V.D.I.-Verlag G.M.B.H. 111 pages, 103 illustrations.

This booklet merits the attention of American readers interested in a somewhat detailed description and excellent illustrations of a modern German industrial plant devoted to the manufacture of steam turbines and turbo-generators. Data on the machine tools include, for example, figures on a milling machine of the portal type with a clear opening of 13x14.5 ft.

Men of the Industry

JOHN M. CROUSE, superintendent of properties of the Niagara, Lockport & Ontario Power Company in the western New York territory, has been made general manager of the Syracuse Lighting Company.

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PROF. JOSEPH W. BARKER, head of the department of electrical engineering at Lehigh University, has been appointed dean of the faculty of engineering of Columbia University to succeed Prof. George B. Pegram, who has resigned after thirteen years of service. Professor Pegram will devote himself to advanced teaching and research in physics at Columbia.

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M. E. SKINNER of Albany, vice-president of the New York Power & Light Corporation, was elected chairman of the commercial section of the Empire State Gas and Electric Association to succeed F. M. Houston of Oneonta at the recent meeting of the organization at Rochester, N. Y. L. A. COLEMAN of New York, vice-president of the New York & Queens Electric Light & Power Company, was named vice-chairman.

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ARNOLD W. MILLIKEN, who was appointed manager of the electric department of the New Bedford (Mass.) Gas & Edison Light Company on January 1, was graduated from Massachusetts Institute of Technology in electrical engineering in 1922. He entered the employ of the New Bedford company in the fall as steam test engineer at the Cannon Street station. In August, 1924, he was appointed assistant to the manager of the electric department and in this capacity handled power sales work in addition to other duties. Mr. Milliken is active in the New England Association of Central Station Power Engineers and is well known in the New England utility industry.

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A. D. CAMERON has been appointed vice-president in charge of sales and purchasing by the Hall Electric Heating Company, Philadelphia. Mr. Cameron, who has been with the General Electric Company at Schenectady, was born in Lockport, N. Y., June 8, 1889, and was in the class of 1911 at Penn State. He entered the General Electric Company as a student in the test department at Lynn, Mass., and subsequently became sales manager of street-lighting equipment. Later he became manager of the lighting and supply division of the central-station department of the General Electric, and last year he was Eastern district manager of the Hurley Machine Company, which is affiliated with the General Electric Company.

OSCAR L. MOORE, since 1925 manager of the customers' department for the Los Angeles Gas & Electric Corporation, has been named as director of that company, to fill the vacancy caused by the death of Champ S. Vance. Mr. Moore joined the organization in 1904 and became auditor in 1917.

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Montefiore Prize Awarded to Westinghouse Engineers

THE GEORGE MONTEFIORE PRIZE for the year 1929 has been awarded to R. D. Evans and C. F. Wagner, Westinghouse engineers, in conjunction with three other engineers, Algeri Marino of Rome and H. Parodi and M. Pestarine of Paris. This triennial prize, presented by the Foundation George Montefiore of Liège, Belgium, for the best original work contributing to scientific advancement in the technical applications of electricity, was given to Messrs. Evans and Wagner for their papers on "Studies of Transmission Stability" and "Static Stability Limits and the Intermediate Condenser Station." The amount awarded to Messrs. Evans and Wagner was 3,000 Belgian francs.

R. D. Evans

Messrs. Evans and Wagner are prominent transmission engineers of the Westinghouse company, having served in various important capacities in conducting research work in transmission line problems and power system stability. Both men are authors of many technical papers presented before the American Institute of Electrical Engineers. Mr. Evans, a graduate of the University of Oklahoma in electrical engineering in 1914, has been connected with the general engineering department of the Westinghouse company since that date. Mr. Wagner was graduated from Carnegie Institute of Technology in 1917, after which he studied for a year at the University of Chicago. Entering the employ of the Westinghouse Electric & Manufacturing Company, he occupied a position in the research engineering department, later transferring to transmission engineering, in which department he at the present time holds an important position.

C. F. Wagner

E. E. WHITNEY has retired as general manager of the Peoples Gas & Electric Company, Oswego, N. Y., to assume his new duties at the Syracuse office of the Niagara Hudson Power Corporation, where he will be in charge of industrial work. He will be succeeded in Oswego by by R. W. Porter, as manager of the local utility. Mr. Porter was formerly manager of the Fulton Light, Heat & Power Company, which was recently acquired by Niagara-Hudson.

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EDWARD L. WILDER, manager of the industrial sales department of the Rochester Gas & Electric Corporation, ended 20 years' service with that company on February 1, when he left Rochester to become general manager of sales with the J. G. White Management Corporation of New York City. Mr. Wilder is an electrical engineering graduate of Cornell University. Following his graduation he became associated with the Westinghouse Electric & Manufacturing Company, going to the Rochester company in 1910. He was made manager of industrial sales in 1921.

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IVAR LUNDGAARD, formerly associated with the Rochester Gas & Electric Corporation, will, after an absence of nine years, assume his duties as manager of its industrial and engineering department. He will succeed E. L. Wilder, who has become affiliated with the Associated Gas & Electric Company. Mr. Lundgaard is a native of Norway and received his higher education in a Norwegian university, graduating as a mechanical engineer. He came to America in 1904 and after working in several cities joined the Rochester utility as designing engineer. He held successively positions of associate engineer, assistant industrial engineer and industrial engineer. When the industrial sales and engineering department was formed in 1915 he was made its manager. In 1921 Mr. Lundgaard left to become associated with the Hartford Refrigerator Company.

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CHARLES R. HIGSON, superintendent of distribution for the Utah Power & Light Company, Salt Lake City, has been elected president of the Engineering Council of Utah. Following his graduation in electrical engineering from the University of Wisconsin, Mr. Higson spent two years with the General Electric Company and then returned to the university and spent the next four years there as instructor in electrical engineering. In 1912 he returned to Salt Lake City, where he had received his early education, and entered the employ of the Utah Light & Traction Company. A year later he became associated with the Utah Power & Light Company as a substation operator and was soon advanced to the position of assistant engineer. He became successively distribution engineer and assistant to the chief engineer, and in August, 1928, was made superintendent of distribution.

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JOHN W. SHEEHEY, division manager of the Burlington Division, Green Mountain Power Corporation, has been appointed operating manager, in charge of all plants, lines and power and lighting departments. Mr. Sheehey has been connected with utility companies for 26 years, during which time he has gained much experience in operation and management. He entered the employ of the Green Mountain Power Corporation in 1917.

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B. P. STOCKWELL, general manager of the Oklahoma Utilities Company and properties of the Empire Public Service Corporation in Oklahoma and Kansas, has been made a vice-president of the parent organization, the Empire Public Service Corporation. He will be vice-president of the gas and electric division of the holding company. He will remain in Bristow and continue as general manager of the Oklahoma and Kansas properties. Mr. Stockwell for several years was gas and electrical engineer of the Oklahoma Corporation Commission.

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OBITUARY

E. F. Peck

E. F. PECK, long connected with the engineering and management firm of Peck, Shannahan & Cherry and its predecessor, Allen & Peck, Inc., is dead. Mr. Peck had not been active in utility work since 1921, when he was run down by an automobile and injured, but he was active in that field for many years, the years of the formative stages of the industry, in which he played a conspicuous part. Born in New Britain, Conn., in 1861, he entered the electrical field in 1880 with the American Electrical Company, New Britain, Conn., this company subsequently becoming the Thomson-Houston Company. Mr. Peck was one of the first electrical experts to be intrusted by this company to install its apparatus. Moreover, he was in charge of the Thomson-Houston Company's exhibit at the Franklin Institute Fair in 1884, the first exhibit devoted solely to electrical apparatus held in the United States. Afterward, he had charge of the exhibit of the same company at the World's Fair in New Orleans in 1884-1885. It was from the Thomson-Houston Company that Mr. Peck resigned in 1885 to become general manager of the Citizens' Electric Illuminating Company, Brooklyn, N. Y. He continued in this capacity until 1897, when he entered the engineering and supply business in New York City under the name of the Peck Electrical Company. Later he served as general manager of the Kings County Electric Light & Power Company, Brooklyn, and general manager of the Schenectady Railway.

At Schenectady he was an officer in both the Schenectady Illuminating Company and the Mohawk Gas Company, in addition to being general manager of the railway, all being under General Electric control at that time. Later these companies passed to joint ownership by the New York Central Railroad and the Delaware & Hudson Company, but Mr. Peck continued with them in active charge until 1912, when he resigned to devote his entire time to the interests of Allen & Peck, Inc.

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EDGAR G. MILLER, treasurer of the Southern California Edison Company, died February 28.

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CLEMENS HERSCHEL, prominent hydraulic engineer, died March 1 at his home in Glen Ridge, N. J., in his eighty-ninth year. He had served as consultant on many important water projects since 1900, including the Niagara Falls power development. A native of Boston, and a graduate of the Lawrence Scientific School at Harvard, Mr. Herschel first engaged in bridge designing and construction, but gradually gave his attention to hydraulic engineering, in which he did much pioneering work. For ten years he served as engineer for the Holyoke Water Power Company, devoting much of his time to research work. He had to his credit many inventions, for one of which he won the Elliott Cresson gold medal of the Franklin Institute of Philadelphia.

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PROF. HECTOR JAMES HUGHES, for the past ten years dean of the Harvard Engineering School, died at his home in Cambridge, Mass., March 1, following a long illness. He was born in Pennsylvania 58 years ago and was graduated from Harvard College in 1894 and in 1899 from the Lawrence Scientific School. Professor Hughes practiced civil engineering for three years and then became an instructor in engineering at Harvard, attaining full professorship in 1914. He was a member of many scientific and engineering organizations and was highly regarded in engineering and educational circles.

Financial and Statistical News

IF ANY reflection upon market quotations of adverse criticism of, or government examination of, the utilities is to be anticipated, it is certainly not yet apparent. These stocks still occupy their position of market leadership.

——THE BOND MARKET SHOWS PERIODIC indications of strength, especially in the convertible issues, but distribution on certain of the new issues is stated to be somewhat slow.

——THE FIRST PREFERRED STOCK ISSUE to be sold this year to date made its appearance this week—a $6 issue sold at $100.

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Standard Gas Minority Holders Move to Block Deal

MINORITY shareholders of the Standard Gas & Electric Company have filed suit in the Supreme Court to block the recently proposed transaction with Standard Power & Light Company and United States Electric Power Corporation. The group asks for an injunction against the deal and for an accounting from all corporations and individuals involved. The suit includes the company, its directors, Standard Power & Light Company, H. M. Byllesby & Company, Ladenburg, Thalmann & Company and the United States Electric Power Corporation. An action was also started against W. C. Langley & Company for $2,500,000 under the charge that that company acted in bad faith in inducing the plaintiff to hold Standard Gas & Electric stock until an alleged pool in the common stock had obtained control. The plaintiffs in the suit are Joseph W. Heil, Frederick W. Trabold, Raymond H. White and the Adamant Corporation, an investment trust.

The principal suit, that directed against H. M. Byllesby & Company, Ladenburg, Thalmann & Company, etc., alleges that the proposal and the action of directors favored the Byllesby organization as against the Standard Gas & Electric Company. The charge recites the various steps in the formation of United States Electric Power Corporation. It states that a minority group, representing some 18,000 shares, opposed the transaction from the start.

The complaint charges that a pool had been formed to secure control of Standard Gas & Electric Company and Standard Power & Light Company and to put the latter in control of the former. It is alleged that the directors of the Standard Gas & Electric Company voted to surrender 2,997,014 shares of preferred voting stock of Standard Power & Light Company, which had given the former company control, to transfer to Standard Power & Light Company property worth $30,000,000 in excess of the value of property received by it from Standard Power, and to take from Standard Gas & Electric Company an income in excess of $1,300,000 a year and give it to Standard Power & Light Company, which would depress the earnings of the former and enhance those of the latter.

The action against W. C. Langley & Company charges that that organization urged the Adamant Corporation not to sell Standard Gas stock when it was near the top price last summer. The defendant represented, it is alleged, that negotiations were under way which would push the stock to much higher levels. Plaintiff retained existing holdings and also purchased more stock. It is charged that these representations were made to defraud the company. The Adamant Corporation stated that on November 11 it had 26,760 shares of Standard Gas & Electric common, of which it wished to sell 1,000 shares when the market was about $86. It was advised to wait until after the Exchange was closed, when the brokers would arrange to take the stock. The Adamant Corporation refrained from selling, it says, and when the Exchange closed was advised that the brokers would take over the plaintiff's stock at $70 a share. The plaintiff alleges that this request was made in order to enable the brokers to obtain the stock for themselves and others associated in the pool, "with the intent that the plaintiff in so liquidating its holdings would sacrifice to the defendants its stock at a great loss."

Asked for a statement on the actions brought, both John J. O'Brien, head of the Byllesby organization, and an officer of Langley & Company stated that the actions were without merit or foundation and would be defended.

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Pacific Companies Vary in Speed of Growth

PACIFIC COAST UTILITY PROPERTIES showed a rather striking variation in degree of growth last year as measured by earnings of representative units. The range of increase in gross earnings was from 4 to 43 per cent. This variation obviously must be considered in relation to the acquisition of additional properties on the part of certain systems.

Furthermore, any direct comparison of the companies must take into account the reduction in the relative proportion of hydro-electric generation as compared with previous years. This proportion was reduced from 90 per cent in 1927 to 75 per cent in 1929.

Gross revenue of all Pacific Coast properties increased 8.7 per cent last year to a total of $185,440,000. Energy output increased by 11.2 per cent to 12,259,040,000 kw.-hr.

The largest increases in gross revenue were shown by Pacific Lighting Company and Southern California Edison Company. The former showed

Name of Company	Gross Earnings 1929	Gross Earnings 1928	Per Cent Increase
Los Angeles Gas & Electric Corporation	$23,902,896	$22,318,592	7
Nevada-California Electric Corporation	5,674,700	5,461,340	4
Pacific Gas & Electric Company	64,819,618	61,788,079	5
Pacific Lighting Company	43,275,306	30,350,631	43
Puget Sound Power & Light Company	16,375,536	15,141,396	8
Southern California Edison Company	40,325,465	35,281,927	14

a growth of 43 per cent and the latter 14. Other companies in the group which have already reported showed a very moderate increase for the year.

Net profit of the Pacific Lighting Company was $7,242,044, which is the equivalent of $4.54 a share on the common stock outstanding at the end of the year, against a comparable figure of $3.81 the year before. Surplus after dividends almost doubled in 1929.

Pacific Gas & Electric Company for the twenty-fourth year established a new record in gross operating revenue in the face of three major industrial depressions and numerous reductions in gas and electric rates.

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NEW CAPITAL ISSUES

American & Foreign Power Company, Inc.
Gold debentures.
Amount $50,000,000.
Price, 90 and interest, yielding more than 5.55 per cent.
Feature, securities mature March 1, 2030.

American & Foreign Power Company controls a group of companies supplying electric light and power and other public utility service in Cuba, Argentina, Brazil, Chile, Mexico, Panama, Guatemala, Ecuador, Colombia, Venezuela, Costa Rica and in the International Settlement of Shanghai, China.

Proceeds from the sale of this issue, together with funds to be received from Electric Bond & Share Company, will be used to retire all existing interest-bearing indebtedness of the company.

Central West Public Service Company
First lien collateral gold bonds.
Amount, $1,050,000.
Price, 90 and interest, yielding over 6.25 per cent.

Central West Public Service Company and its subsidiaries supply utility service in 249 communities in Illinois, Iowa, Minnesota, Nebraska, North Dakota, South Dakota and Texas.

Montreal Light, Heat & Power Consolidated.
First refunding and collateral trust gold bonds, series B.
Amount $5,000,000.
Price, 99 and interest, yielding over 5.05 per cent.
Feature, annual cumulative sinking fund commencing March 1, 1931, sufficient to redeem by maturity one-third of bonds of series B.

Montreal Light, Heat & Power Consolidated operates one of the largest public utility systems in Canada.

Arkansas Power & Light Company
Cumulative preferred stock.
Amount, $3,000,000.
Price, $100 and accrued interest.

Arkansas Power & Light Company supplies electric power and light service to a large part of the State of Arkansas. Proceeds will be used to reimburse the company for expenditures made for property additions and acquisitions and will provide funds for carrying on its large construction program and for other corporate purposes.

Output in 1929 Rose 11 per Cent

PRELIMINARY FIGURES OF THE total production of electricity by public utility power plants in the United States in 1929 indicate an output of 97,294,000,000 kw.-hr., an increase of nearly 11 per cent over the output in 1928, according to a preliminary report of the U. S. Geological Survey. These figures include the output of electric railway and other plants supplying energy for public use as well as central stations.

The low precipitation throughout the country during 1929 resulted in low water in most of the streams used for water power, and in consequence the production of electricity at hydro-electric plants was about 1½ per cent less than in 1928. The water-power output during the previous seven years had shown increases ranging from 3 to 17 per cent and averaging 13 per cent. As a result of the decrease in 1929, fuel-burning power plants were forced not only to supply the usual yearly increase in the demand for electricity but also to make up the deficiency in output at water-power plants. That the fuel-burning plants were able without trouble to take care of this increased and unexpected demand for electricity speaks well for the judgment and foresight of those responsible for providing adequate equipment at public utility power plants for emergency use as well as for future growth, the report states.

The annual increase in output of electricity by the use of fuels for 1927 and 1928 was about 5½ per cent. In 1929 the increase was 18 per cent, or about three times the increase for each of the preceding two years. The increases in consumption of coal, oil, and gas over 1928 were 9, 41 and 46 per cent respectively. Although the unusual increase in the output of electricity by fuel-burning plants might have been expected to reduce their efficiency in the use of fuel, they continued the improvement in efficiency which has been shown for many years, reducing the average rate of fuel consumption from the equivalent of 1.76 lb. of coal per kilowatt-hour in 1928 to 1.69 lb. in 1929. This saving of 0.07 lb. or 1⅛ oz. of coal per kilowatt-hour amounted to 2,200,000 tons of coal during 1929 and represents a total saving of about $9,000,000. The increase of efficiency thus indicated is most forcibly shown by noting that the increase in output of electricity by the use of fuels from 1928 to 1929 was 18 per cent, while the consumption of fuels increased only 13 per cent.

Some of the data by geographical regions are summarized in the table. In the final report, to be published in April, the energy output will be given for each state.

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NEWS BRIEFS

Directors of Pacific Lighting Corporation voted to offer common-stock holders of record March 15 the right to subscribe to one share of new stock at $50 a share, payable May 1, for each ten shares held. Stockholders will be given the option of deferred payments with one-half the amount due May 1 and the balance August 1.

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Approval of an immediate construction program, amounting to $4,800,000, has been voted by the board of directors of the Virginia Electric & Power Company. Other construction contemplated, but not yet approved, will increase the company's total budget this year between $6,000,000 and $7,000,000. More than $1,500,000 will be spent by the company this year in Richmond, the sum of $1,375,000 being allotted for the electric division and $158,000 for the transportation division.

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The New York Stock Exchange has authorized the listing on official notice of issuance the following securities of General Gas & Electric Corporation: 4,000,000 shares new common stock, class A, to provide for the exchange of 800,000 shares of old common stock, class A, on the basis of five for one; 713,100 shares of new common stock,

OUTPUT OF PUBLIC UTILITY PLANTS IN 1929, INCLUDING ELECTRIC RAILWAYS

	Thousands of Kw.-Hr.			Per Cent Increase Over 1928		
Region	Total	Water Power	Fuel Power	Total	Water Power	Fuel Power
United States	**97,293,683**	**34,609,666**	**62,684,017**	**+ 10.7**	**— 0.4**	**+ 18.0**
New England	6,628,400	2,022,639	4,605,761	+11 7	—14 7	+ 29.2
Middle Atlantic	24,711,130	6,450,706	18,320,424	+ 9.1	— 1.1	+ 13.5
East North Central	23,264,949	2,510,344	20,754,605	+11.0	— 4.6	+ 13.3
West North Central	5,674,085	1,588,460	4,085,625	+10.9	— 9.5	+ 21.5
South Atlantic	11,900,201	6,561,849	5,338,352	+12.7	+17.4	+ 7.5
East South Central	3,634,222	2,811,316	822,906	+ 9.2	+ 6.4	+ 20.0
West South Central	4,897,465	72,490	4,824,975	+21.7	+49.0	+ 21.3
Mountain	3,967,326	3,282,408	684,918	+ 1.3	— 4.2	+ 40.0
Pacific	12,555,905	9,309,454	3,246,451	+10.5	— 4.6	+102.0

class A, to provide for exchange of 380,-320 dividend participations; 100,697 shares of new common stock, class A, to provide for the dividends declared and payable April 1 on the common stocks, class A and class B; 2,000,000 shares of its new common stock, class B, to provide for the exchange of 400,-000 shares of old common stock, class B, on the basis of five for one.

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Additional 30-year first mortgage 5 per cent gold bonds of the Utah Power & Light Company to the amount of $4,000,000 have been authorized for listing by the New York Stock Exchange.

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A Power System Promotes Industrial Growth

THE Niagara Hudson Power Corporation's part in the industrial development of New York State was discussed before resident managers and department heads of the New York Power & Light Corporation at a meeting held at Albany recently. The speaker was Don G. Mitchell, director of the Niagara Hudson industrial development bureau.

Mr. Mitchell, after explaining the purposes and methods of operation of the bureau, outlined at some length the valuable information it hopes to collect through a questionnaire just prepared. This information will be collected through the local managers from all industries operating in the company's territory and is for the purpose of determining essential facts to guide the bureau in being of assistance to the industries already established.

The questionnaire, he said, seeks information regarding buildings, number of employees, products manufactured, markets, raw and semi-finished materials purchased, by-products, etc. With this information, which is kept in strictest confidence, it may be possible for the bureau to help present industries in the following ways: To uncover new markets for their products within the state; to unearth new sources of raw materials required, near at hand; to find more profitable means of selling or converting by-products. It is the bureau's specific aim not only to bring new industries into New York State, but to assist those already located here.

Study of market possibilities

This survey should result in a considerable increase in interplant buying within the state and it should prove the basis for securing a large number of complementary industries to round out the state's industrial picture. By complementary industries is meant those industries that fit naturally into the present industrial set-up.

The company's interest in this matter, he said, is that the industrial prosperity of any part of the state will definitely benefit the state as a whole. Since the company's prosperity depends primarily upon the sale of more electricity and inasmuch as 80 per cent, or more, of this product is sold to industry, it follows that continued prosperity depends upon obtaining more and larger industrial users. New industries and more prosperous present industries mean more employees and larger payrolls, which means that these employees use more electricity in their homes and buy goods in stores that are thereby enabled to put in better lighting equipment. In short, it follows that prosperity for any one group is in a large measure dependent upon the prosperity of all.

The bureau is analyzing the manufacturing and marketing possibilities of new products and processes at the rate of about ten a week, to see whether they can be developed successfully in New York State factories with New York State capital. Not more than one in a hundred of the inventions brought to its attention have any possibility of commercial development, but each is investigated to make sure that it is not passing up a worth-while opportunity.

The Niagara Hudson industrial bureau, with Mr. Mitchell as its head and Joseph K. Moore as technical director, was formed about three months ago and has its headquarters at Albany. Its activities extend throughout that part of New York State served by the Niagara Hudson Power Corporation. Both Mr. Mitchell and Mr. Moore are widely known industrial development experts and since their association with the Niagara Hudson Bureau have already laid a substantial groundwork for the industrial development of the territory.

Mr. Mitchell was also the speaker recently at a meeting of the Albany Advertising Club, held at the Dewitt Clinton Hotel. To this group he explained the important part advertising is to play in this program of development and touched on the features of the national advertising campaign which the industrial bureau is now conducting at a cost of $175,000 annually.

Customer-Ownership Sales in November and December

SALES OF ELECTRIC light and power company stock to customers, employees and other local parties dropped to $8,713,000 in November and rose slightly in December to $9,607,000. The corresponding number of shares sold was 119,150 in November and 131,700 in December, and the transactions were 20,000 and 18,200 respectively. Thus the average transactions were about $436 in November and $528 in December. These figures show a decided decrease as compared with the previous six months of 1929, but coincide almost exactly with $8,360,000 and $9,574,000 for November and December, 1928.

Sales were generally inactive except for one large system that has been conducting some very extensive customer-ownership campaigns and which reported sales of over $2,000,000 in November and more than $3,000,000 in December. One other company had sales of over $1,000,000 in November. The only other large sale reported in December was about $800,000.

The estimated national totals here given are based on monthly returns received by the ELECTRICAL WORLD from central-station companies throughout the United States.

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German General Electric Issue Sold Here

THE OFFERING IS ANNOUNCED of $14,000,000 principal amount of participating debentures of the Siemens & Halske A. G. of Germany, part of a loan of approximately $32,500,000 being undertaken by the company, which is one of the largest electrical equipment organizations in Germany. The debentures are priced at $933 and are entitled to interest at the prevailing dividend rate on the common stock. Current yield on the basis of the 14 per cent dividend on the common stock is 6 per cent.

An unusual feature of the issue is the term of 1,000 years. The bonds will fall due on January 15, 2930, but they are redeemable, at the option of the holder, on any interest date after 75 years if payment is demanded six months before the date.

This loan represents the most important industrial financing done in the American market recently. The majority of the loan has been taken up in advance of the formal offering. The International General Electric Company, controlling the foreign investments and foreign manufacturing and selling organizations of the General Electric Company, will subscribe for a substantial amount of the new debentures.

Business News and Markets

Electrical Equipment Outlook*

WHETHER general business is up to 110 per cent or down to 90 per cent, there are always some concerns that are going to make money and still others who are going to lose it. Of course, it is only the grossly inefficient who will lose when there is an excess of business, and again it is only the genuinely efficient who will make money when the going is hard. The statement is made, I don't know with what degree of scientific accuracy, but certainly with some approach to the truth, that the difference between good business and poor is after all only about 10 per cent.

If that is true, it would seem that the only people who should be seriously concerned about recessions in business are the bankers, for that 10 per cent just about represents the amount saved and invested by our people. And as far as I have been able to observe there are not many bankers worrying about their future prosperity. The attitude of the courageous individual or business concern under present conditions will be one, not of despair, but of aggressive determination to get business, of stimulated and more intelligent effort, of fact-finding analyses of his methods, his markets and his personnel. Rather than concluding that there is 10 per cent or 25 per cent less business in sight, he will strive to maintain or increase his volume by putting 10 per cent or 25 per cent more efficiency in all that he does.

I know of few industries where there is less reason for a disturbed outlook than in your own.† I realize that you have your full share of problems—stiff competition, narrow profit margins, surplus plant capacity, high distributing costs, quick obsolescence in many items, etc. Even so, your products are ones in which the public is vastly interested. Many of them have passed distinctly beyond the luxury stage; they are regarded as indispensable to modern living. Many others which are still luxuries are wholeheartedly wanted—there is a predisposition for them in homes throughout the country. All progress, the psychologists tell us, is based on creating more desires among people. If they want a product badly enough they will find a way to get it—slow times notwithstanding. The American people definitely want electrical equipment—vacuum cleaners, radios, electric refrigeration—not to mention the hundreds of small accessories which are now standard equipment in the modern home. Through replacements in homes already equipped, through initial installation in the 30 per cent which are not even yet wired with electricity, to say nothing of the very considerable number of homes that are only partially equipped, a market of very large proportions still awaits you. Earning power has not been appreciably affected in most of those homes. Greater caution is there, it is true, and more exacting buying requirements. But a favorable attitude toward your product is still there. Need any two-fisted merchandise manager be disheartened by that situation? Granting that 1930 business as a whole may not top the high spots of recent years, it can still be exceptionally good for those who, undaunted by difficulties, go out after it. The surprising thing about the whole situation, too, is that if there are enough who adopt the latter policy, the business situation is likely to be thoroughly good for all—proving that business is pretty much what we make it.

Excerpts from an address made by A. E. Bryson, vice-president Halsey, Stuart & Company, at the merchandise sales conference, Commercial Section, Great Lakes Division, N.E.L.A.

†Electrical manufacturing industry.

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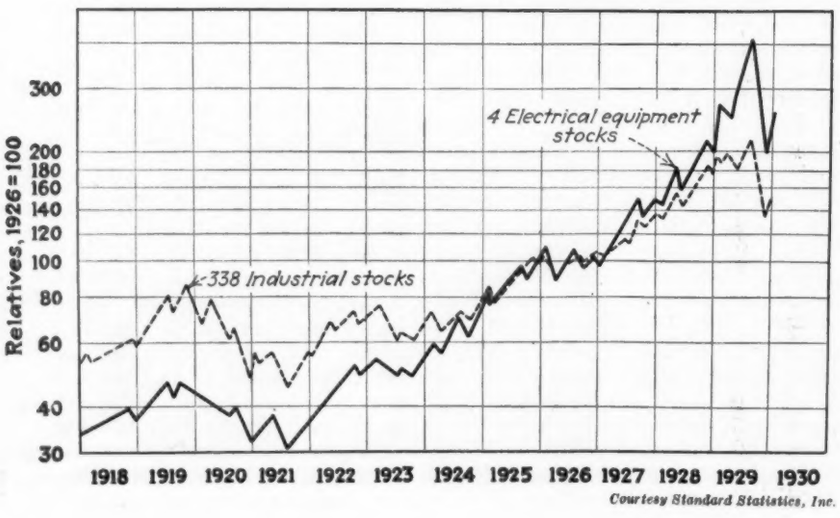
TWELVE-YEAR TREND IN EQUIPMENT STOCKS



Courtesy Standard Statistics, Inc.

Commerce Department Studies Small Motor Market

A SURVEY OF THE fractional-horsepower motors that are being used for various purposes is being considered by the electrical division of the Department of Commerce. Several requests have been received by the department from firms contemplating the production of small motors, asking if information could be compiled showing the uses to which these motors are put. After discussion, department officials have become amazed at the dearth of information available.

It is thought that electrical manufacturing companies producing less than 1-hp. motors would obtain much benefit through the gathering of statistics relating to distribution. Several thousands of uses probably would be listed. These uses would be grouped under a restricted number of major classifications. By obtaining these figures over a period of years, manufacturers would be afforded a better opportunity than they apparently have at present for detecting their best markets. Similarly, it would be shown which markets would be the most susceptible of development.

Ohio Brass Elects New Officers

FOLLOWING THE RECENT directors' meeting of the Ohio Brass Company, announcement was made of the election of G. L. Draffan as secretary, W. A. Springer as treasurer and J. M. Strickler as general sales manager. Mr. Draffan has been associated with the Ohio Brass Company since 1916 and before his election to the secretaryship he served as general sales manager. Mr. Springer is also a veteran, having devoted practically his whole business life to the Ohio Brass Company. Mr. Strickler, the new general sales manager, entered the employ of the Ohio Brass Company in 1906 as an office boy.

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Copper Prices Unchanged

	Feb. 26, 1930 Cents per Pound	March 5, 1930 Cents per Pound
Copper, electrolytic....	18	18
Lead, Am. S. & R. price	6.25	6
Antimony.....	9	8¾
Nickel, ingot.....	35	35
Zinc, spots.....	5.50	5.35
Tin, straits.....	38¼	36¼
Aluminum, 99 per cent	24.30	24.30

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TRADE BRIEFS

Bristol Company, manufacturer of recording instruments, has opened a new sales and service office in Los Angeles. S. W. Case has been appointed district manager and W. H. Rogers sales and service engineer.

•

Hurley Machine Company announces the appointment of John J. Cooper as manager of its intermountain division, with headquarters in Denver.

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Frankfort Lumber Company, producer of preserved wood products, announces the removal of its general offices from Columbus, Ohio, to 220 Broadway, New York City. Warren B. Sisson, president, will make his headquarters in New York and Fred B. Mewhinney will be his associate in this office.

•

Square D Company of Detroit, Mich., has recently placed all its accounts, salaries and internal records on a basis of the new thirteen-period year. This plan has been adopted by a number of prominent American corporations.

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The Detroit district sales office of Cutler-Hammer, Inc., manufacturer of electric control apparatus, has been moved to 2755 East Grand Boulevard, Detroit. The new location includes warehouse facilities for stocks of standard motor control, wiring devices, safety switches and other products carried for immediate delivery.

•

General Electric Company has moved the Atlantic district sales and service departments at Philadelphia from the Witherspoon Building, which it had occupied for 22 years. The sales and engineering departments now occupy the seventeenth, eighteenth and nineteenth floors of the Mitten Building, Broad and Locust Streets. The Washington office of the General Electric Company and the Edison Lamp Works is moving from its present address about January 18 to the Shoreham Building, 800 Fifteenth Street, N. W., Washington, D. C.

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The National Electrical Credit Association will hold its 32d annual meeting at the William Penn Hotel, Pittsburgh, Thursday and Friday, May 22 and 23.

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Market Conditions

THE PAST week has been the best this year to date in the equipment business throughout the East. Orders for transformers and substation apparatus have been substantial and demand from the iron and steel industry has improved measurably.

——CONSTRUCTION WORK IS GETTING under way throughout the Middle West as the weather improves. This is reflected in sizable equipment orders.

——POWER COMPANY ORDERS are very good on the Pacific Coast, but contractors report business unusually slack.

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PACIFIC COAST

—BUSINESS FROM *power companies is very good. From industrials, especially oil and paper companies, it is good, and from railroads, dealers and jobbers it is fair. Contractors, however, report poor business.*

—MACHINERY MANUFACTURERS *report no large outstanding orders but an excellent run of fair-sized staples, such as motors and transformers. Seasonal pumping plant material is just being ordered and the recent heavy rains came too late to affect this demand, which is expected to be heavy.*

Power company orders include three carloads of 40-ft. treated poles for the Central Coast valleys district, $7,500 worth of No. 4/0 leaded and paper cable for Oakland stock, two carloads of bare copper wire, sizes Nos. 1/0 and 2, for San Joaquin valley distribution and two carloads of poles and 3 miles of heavy cable for Los Angeles district. Prospective business includes $100,000 worth of large transformers and regulators for San Francisco and a proposal for a year's rubber-covered wire and cable requirements, costing about $60,000, from a power company. Steel strand and line hardware business has been particularly good. Machinery orders include a $2,000 switchboard for a Hawaiian plantation; four ventilating motors and controls, value $7,000, for the central heating plant of University of California; three General Electric 600-hp. motors, value $8,000, for a station steam plant in San Francisco; $15,000 worth of Westinghouse motors for a Washinton paper plant; $12,000 worth of regulators and $15,000 worth of Westinghouse rotors and stators for a Los Angeles pump company.

Bids were opened February 28 by the Board of Public Works, Seattle, for furnishing approximately $1,750,000 worth of generating equipment, station transformers, waterwheel and accessories for a hydro-electric plant near Diablo dam being considered. Sales reported last week include: Switchboard for a pulp mill in Snohomish County costing about $15,000 by the A. G. Manufacturing Company, 2,500 stand fixtures to the city of Seattle by the General Electric Company for between $12,000 and $15,000, six motors from 200 hp. down to sawmills, pulp mills and industrials, $4,000 worth of motors to an Oregon sawmill ranging from 200 hp. down, several 75 and 30 hp. motors to a pulp mill on Olympic Peninsula and eight from 25 hp. down to a mill and woodworking plant in Puget Sound district. Pump and motor buying by irrigation and Orchard districts in eastern Washington are ex-

pected to be heavy during March and April, one firm last week reporting the movement of eighteen motors from 200 hp. down. Other orders reported involved 2- and 3-in. pumps and from 3- to 5-hp. motors. Adkison & Dill, Victoria, B. C., bidding $115,500, submitted low offer for construction of a power house at the Royal City Mental Hospital, Victoria.

Westinghouse secured awards from Board of Public Works at special meeting for two 66,700-kva. turbines and seven 22,250-kva. transformers for the Diablo project. Award for three 1,000-kva. transformers for the same project were let to the Moloney Electric Company.

CONSTRUCTION PROJECTS

Southern Sierras Power Company, Riverside, Calif., will build power substation at Elsinore, Calif., to cost $50,000. Mutual Orange Distributors, Inc., Redlands, Calif., plans packing plant at Ontario, Calif., to cost $100,000. Consolidated Orange Growers' Association, Orange, Calif., plans precooling plant to cost $80,000. Pacific Coast Steel Company, Los Angeles, plans fabricating plant to cost $125,000. Pacific Electric Railway Company, Los Angeles, has plans for power substation to cost $50,000. Consolidated Chemical Industries, Inc., San Francisco, plans plant to cost $300,000. Arco Company, Cleveland, Ohio, contemplates plant at Los Angeles, Calif., to cost $200,000. San Joaquin Light & Power Company, Fresno, Calif., plans equipment storage and distributing plant reported to cost $80,000. Great Northern Railway Company, St. Paul, Minn., contemplates power plant at Great Falls, Mont., to cost $200,000; also, a plant at Havre, Mont., to cost $125,000. Butte, Mont., will receive bids until March 19, for an ornamental lighting system. Pacific States Pulp & Paper Company, Spokane, Wash., plans pulp mill at Priest River, Idaho, to cost $1,000,000.

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NEW ENGLAND

—HEAVY ELECTRICAL EQUIPMENT *sales during the past week gained. Motor sales were steady. Central-station supplies are in good demand. Merchandising shows a gain over that reported for last year.*

During the past week sales of heavy electrical machinery included orders amounting to over $500,000 for a large paper mill development in eastern Maine and including general purpose motors, synchronous motors, transformers and outside control. Inquiries for turbo-generators are steady. Recently an eastern Massachusetts power plant placed orders for one 12,500-kw. unit and one 2,500-kw. unit.

Small motor sales show a steady trend and this year to date marks a slight gain in volume over that for a corresponding period of last year. Inquiries for line materials are being received. Bids are in for a large order of insulators to be used on transmission line construction in Maine; scheduled material orders are holding up well. Meter sales are encouraging and compare favorably with last year. Prospects for continued sales in electrical equipment are reported promising in view of the increasing volume of inquiries being received by manufacturers in this district.

General merchandising progress is good. Sales of appliances show an upward trend.

CONSTRUCTION PROJECTS

Middlesex College of Medicine & Surgery, Waltham, Mass., plans power plant, reported to cost $50,000. Cape Refrigerating Company, Plymouth, Mass., has filed plans for a refrigerating plant reported to cost over $50,000.

SOUTHEAST

—EXCEPT FOR A *reasonably satisfactory volume of small orders placed, there is little activity to be noted in the Southeast.*

Bids are to be asked on underground cable that is estimated to cost approximately $20,000 for an Alabama power company, but it will probably be several weeks before the order is placed. One of the larger companies last week placed an order for rails for the street railway system, the order amounting to $20,000. Its distribution and small power transformer orders in the week aggregated $13,950, while its house type meter business totaled $9,200. Coal-crushing equipment amounting to $5,150 was ordered for the Atkinson steam plant being constructed near Atlanta. A motor order to total approximately $100,000 is pending in Tennessee and will probably be let within the next week or ten days. Contract has been let covering an extension to a rayon plant in Tennessee, the total contract running between $300,000 and $400,000 and the electrical materials will cost in the neighborhood of $180,000. Bids are in on wiring materials for two office buildings recently started in Atlanta and materials costing approximately $70,000 will be ordered in the near future for these two jobs.

CONSTRUCTION PROJECTS

Tennessee Paper Mills, Inc., Chattanooga, Tenn., plans extensions and improvements in power plant to cost about $60,000. Standard Oil Company of New York, Baltimore, Md., has filed plans for storage and distributing plant at Columbia, S. C., to cost $300,000. Mobile, Ala., is reported planning a municipal electric light and power plant.

Carlisle Veneer Company, Jackson, Ala., plans veneer mill near Riceboro, Ga., to cost about $100,000. Georgia Power Company, Atlanta, Ga., plans addition to Piedmont substation to double present capacity, reported to cost over $100,000. Tampa, Fla., contemplates installation of floodlighting system and beacon lamps at proposed municipal airport to cost $500,000. Plant Land & Food Company, Dundee, Fla., contemplates food product plant to cost $100,000.

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MIDDLE WEST

—A SLIGHT ACCELERATION *in general business was noticeable the last week in this month in the Middle West section. The volume of business increased somewhat and February is expected to show an improvement in business over the preceding month. Carloadings were higher but considerably below the corresponding period last year.*

—MAJOR ACTIVITIES, *steel, railroad, automotive and electrical industries, improved their positions somewhat and are looking forward to the coming month with confidence. The various utility companies are continuing their conservative policies, planning for a normal expansion in business. With the milder weather much construction work is getting under way.*

Some of the interesting orders placed this week include 200 25-kva., 200 37½-kva., 100 50-kva. and 50 75-kva. pole type distribution transformers, crane equipment valued at $166,000, air compressors to cost $10,000, erection of electrical equipment for generating unit to cost $250,000 and several construction orders aggregating $100,000.

Jobbers' sales show a slight increase. Industrial activity is still somewhat spotty, although some slight improvement is noticeable. There has been a good demand for most electrical appliances.

CONSTRUCTION PROJECTS

Waukesha County Commissioners, Waukesha, Wis., has plans for power plant at County Asylum, to cost $50,000. United States Rubber Company, Detroit, Mich., will make alterations and improvements in power plant to cost about $50,000. Michigan Paper Company, Plainwell, Mich., plans power plant to cost about $300,000. Antrim Iron Company, Mancelona, Mich., will make extensions to cost $100,000. Detroit Edison Company plans power substation to cost $60,000. Bohn Aluminum & Brass Corporation, Detroit, Mich., has authorized plans for plant to cost $1,000,000. Holland, Mich., will make extensions and improvements in municipal power plant to cost $125,000.

Standard Dairy Company, Rockford, Ill., plans plant to cost $100,000. Rockford Electric Company, Rockford, Ill., plans power substation to cost $100,000. Public Service Company of Northern Illinois, Chicago, Ill., will soon begin addition to power plant at Waukegan, to cost $150,000. Indiana Boys' School, Plainfield, Ind., contemplates power plant to cost about $50,000. Central Insane Hospital, Indianapolis, Ind., has filed plans for power plant to cost $200,000. Aluminum Industries, Inc., Cincinnati, Ohio, has filed plans for addition to cost $100,000. Feldspar Com-

pany of Canada, Ltd., Cleveland, Ohio, plans plant to cost $100,000. Union Steel Products Company, Youngstown, Ohio, contemplates plant to cost $85,000. Brainerd, Minn., plans installation of switchboard at municipal power plant.

St. Paul, Austin, and Duluth, Minn., plan ornamental lighting systems. Bay State Milling Company, Falls City, Neb., plans extensions and improvements in municipal power plant to cost $55,000. Chicago, Burlington & Quincy Railroad, Chicago, Ill., has plans nearing completion for power plant at Omaha, Neb., to cost $80,000. International Harvester Company, Chicago, Ill., has plans for factory branch and distributing plant at Grand Island, Neb., reported to cost $85,000. Des Moines Electric Light Company, Des Moines, Iowa, plans extensions and improvements in power plant to cost $2,500,000.

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EASTERN

—WELL-SUSTAINED DEMAND *for electrical equipment is bringing an improved tone in the New York market. Central stations continue to place sizable commitments for transformers and other substation apparatus and the week's total is one of the largest since the turn of 1930.*

—INDUSTRIAL DEMAND, *particularly from the iron and steel industry, shows noticeable betterment. Steam railroad electrification work has recorded a $1,500,000 order for equipment for power supply, and the outlook in this line gives excellent promise.*

A manufacturer of heavy and light electrical equipment says that business is showing a constant upward trend of encouraging extent. A metropolitan central station has placed an order for transformers, network circuit breakers and auxiliary equipment to an amount of $175,000. Another metropolitan power company has contracted for transformers and accessories to the sum of $200,000. A Pennsylvania manufacturer is scheduled to receive an order from the government for a turbo-generator unit for an installation at Washington, totaling $200,000. A New York maker has secured a contract for transformers, switchboard apparatus and auxiliary equipment from a central station in Westchester County, aggregating $120,000.

One of the steam railroads at New York has placed a contract with a state manufacturer for substation equipment, switching apparatus and auxiliaries to cost $1,500,000, in connection with an electrification project for its freight lines in the west side district. Inquiries are holding up well for equipment for railway electrification, as well as for traction and motor bus service, and sizable account is slated for early commitment. The Pusey & Jones Company, Wilmington, Del., will build four electric-operated towboats for an Eastern railroad, for use in New York harbor, to cost close to $1,000,000.

Industrial account shows signs of early improvement for spring sales. Iron and steel mills are in the market and some good business for heavy mill motors, substation apparatus, etc., looms just ahead. A New Jersey manufacturer reports a large order from this quarter for motors and other mill electrification equipment. A Pennsylvania maker has secured a contract from a steel company in the state for the electrification of its merchant bar mills, to include two 1,000-kw. motor-generator sets, six mill motors, varying from 600 to 1,000 hp. rating, switching and control apparatus complete.

CONSTRUCTION PROJECTS

Westchester Lighting Company, Mount Vernon, N. Y., will build a power substation at Pleasantville to cost $150,000. Bell Telephone Laboratories, New York, has filed plans for improvements in factory to cost $100,000. Delaware, Lackawanna & Western Railroad, New York, will receive bids until March 14 for ten motor-generator sets, seventeen storage batteries, eight battery-charging rectifiers and five control panels. Our Lady of Lourdes Memorial, Binghamton, N. Y., plans power plant in connection with institutional building to cost $400,000. Queen City Milling Company, Buffalo, N. Y., will build a mill to cost $100,000.

Barber Asphalt Company, Perth Amboy, N. J., will build addition to asphalt refinery to cost $180,000. United States Rubber Company, New York, has completed plans for addition to plant at Passaic, N. J., to cost $1,000,000. Trenton Potteries Company, Trenton, N. J., has filed plans for addition to sanitaryware plant to cost $175,000. Reading Company, Philadelphia, Pa., will build addition to terminal storage and distributing plant to cost $630,000. Robertson Art Tile Company, Morrisville, Pa., has plans for an addition to cost about $80,000. Pittsburgh Water Heater Company, Pittsburgh, Pa., contemplates plant at Toronto, Ont., to cost $85,000. Pennsylvania Power Company, Sharon, Pa., plans equipment storage and distributing plant, with service unit, to cost $100,000. McKeesport, Pa., plans industrial school to cost $500,000. Potomac Electric Power Company, Washington, D. C., will have plans drawn for addition to Bennings steam-electric power plant, including installation of 30,000-kw. generating unit, to cost $2,500,000. J. Phillips Sausage Company, Washington, has plans for factory addition to cost $100,000.

Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until March 18 for motor control equipment, force draft fan with electric motor for Boston navy yard (Schedule 2957). General Purchasing Officer, Panama Canal, Washington, will receive bids until March 18 for one electric light plant, two switchboards and one portable air compressor (Panama Schedule 2537); also, until March 22, for transformers, panelboards, wire and cable, lighting projectors, etc. (Panama Schedule 2539). Bureau of Yards and Docks, Navy Department, Washington, will receive bids until March 12 for a 3,750-kva. turbo-alternator and other apparatus for naval powder plant at Indianhead, Md. (Specification 6099.)

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SOUTHWEST

—WHILE THERE *has been no particular change in conditions in this district manufacturers report a disposition to keep stocks down and buy small orders. One representative made the statement that while the total sales for the first two months of this year amounted to about the same as last year's the number of orders were 25 per cent more.*

The following contracts have been closed: A 3,000-kw. turbo-generator with jet condenser, to cost $64,000; generator motors and electrical equipment for dredge, $22,000; control equipment for industrial plant, $9,000, and meters, transformers and lightning arresters for a transmission line in southwest Missouri, $12,000.

CONSTRUCTION PROJECTS

Laclede-Christy Clay Products Company, St. Louis, Mo., has plans for addition to fire brick and refractory plant to cost $200,000. Mancha Storage Battery Locomotive Company, St. Louis, Mo., contemplates an addition reported to cost close to $100,000. Kirksville, Mo., is planning bond issue of $300,000 for municipal light and power plant. Union Electric Light & Power Company, St. Louis, has filed plans for a power substation to cost $65,000. Broderick & Bascom Rope Company, St. Louis, Mo., contemplates wire rope plant at Seattle, Wash., to cost about $90,000. Campbell, Mo., will soon take bids for municipal light and power plant to cost $75,000. Creo-Dipt Manufacturing Company, Kansas City, Mo., plans addition to creosoted shingle plant to cost $100,000.

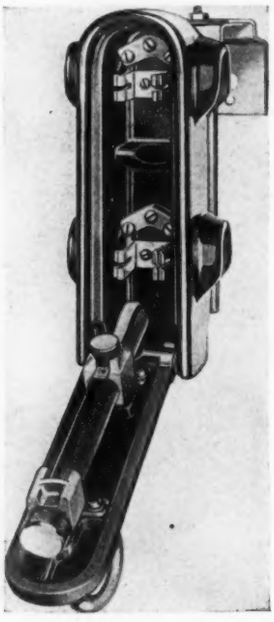
Empire District Electric Company, Joplin, Mo., plans transmission line for about 40 miles, to operate at 66,000 volts. United Light & Power Corporation, Abilene, Kan., plans power plant at Manhattan, Kan., to cost over $200,000. Southwestern Light & Power Company, Oklahoma City, Okla., plans power substation and switching plant at Hobart, Okla., to cost $40,000. West Texas Utilities Company, Abilene, Tex., will make extensions and improvements in power plant and system in vicinity of Dalhart, Tex., including ice-manufacturing plant to cost $200,000, entire project to cost $400,000. Prairie View State Normal and Industrial College, Prairie View, Tex., will build industrial school unit to cost $200,000. Gulf States Utilities Company, Beaumont, Tex., will make extensions in power plant and system at Colmesneil, Tex., to cost over $75,000.

Houston Cooperage & Tub Company, Houston, Tex., contemplates plant at El Paso, reported to cost $100,000. Southwestern Public Service Company, Amarillo, Tex., will proceed with superstructure for addition to power plant to cost $100,000. Texas-Louisiana Power Company, Fort Worth, Tex., will make extensions and improvements in transmission line, substations and distributing system at Spearman, Tex.

New Equipment Available

7,500-Volt, 60-Amp. Arc-Chute Expulsion Fuse

A NEW TYPE of arc chute expulsion fuse, known as P-75C6, has been announced by the Line Material Company, South Milwaukee, Wis. The housing is of wet



porcelain, brown glazed inside and out. The barrier between terminals and protecting arched ridges over entrances for feed wires improves leakage and flashover values. Flashover between terminals and hanger (door closed) is 43,000 volts dry and 27,000 volts wet.

The fuse is equipped with double phosphor bronze spring clips, split to insure uniformly distributed pressure, securely fastened to cast copper V-shaped terminal elements and drilled to receive from either side lead wires up to No. 2 solid.

The cartridge floats on four brass screws to insure alignment of contacts. The maximum rating is 7,500 volts, 60-amp., continuous carrying capacity.

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Expansion Bends to Protect Bushings

A STANDARDIZED LINE of expansion bends for connecting rigid conductors to transformer and oil circuit breaker studs has been announced by the General Electric Company. The bends are made from rectangular copper bar.

These devices prevent the bushings from being subjected to strains which result from thermal expansion of conductors and uneven settling of the transformer and oil circuit breaker. They are applicable to copper bar and copper tubing. In the latter application, however, it is necessary to flatten the tubing at the point where the expansion bend is attached or to attach a terminal to the tubing and thence to the expansion bend. These bends are supplied with necessary galvanized hardware, although "Everdur" hardware is supplied upon request.

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AN ELECTRIC SOLDERING IRON HEATER which operates at 110 volts, 15 amp., 1,600 watts has been announced by the Bellevue Industrial Furnace Company, 2971 Bellevue Avenue, Detroit, Mich. It can be attached to any 110-volt outlet. The Globar cartridge type heating elements are replaceable while furnace is at full heat. No dismantling of the heater is required. Heater can also be used for annealing and hardening of small parts.

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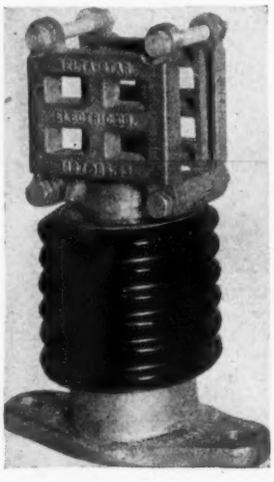
Center Bolt Type Bus Support

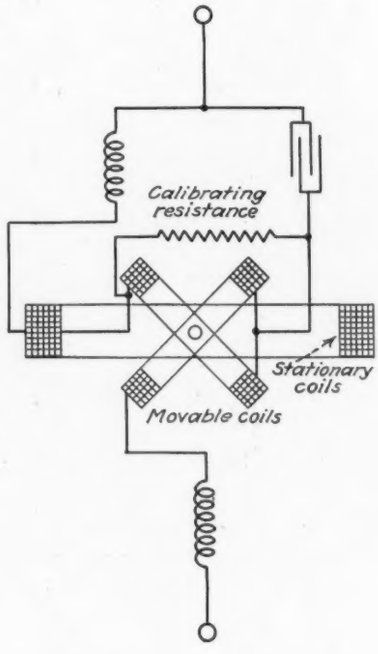
A HEAVY-DUTY TYPE of bus support of the center-bolt form has been developed by the Delta-Star Electric Company, Chicago, Ill. The 6-in. diameter insulator unit has at each end metal inserts threaded at the center for bolts



by which top and bottom fittings are attached. Advantage of this single-bolt construction is that the fittings can be turned 360 deg. in a horizontal plane, permitting the bus to be run at any desired angle to the supporting structure.

Indicating Frequency Meter of Resonant Type

A FREQUENCY METER of the indicating type has been announced by the Westinghouse Electric & Manufacturing Company in Newark, N. J. The design of this type Sy frequency meter permits the production of instruments having a scale range of plus or minus 2 cycles for 60-cycle work, with operat-



ing torques at least equal to those used in corresponding voltmeters and with a remarkable freedom from temperature or voltage error effects, the manufacturer states.

The new type Sy instruments differ from the usual reasonance type of ratio instruments in that a single resonant circuit of the parallel type is employed, which results in a very low volt-ampere burden. The ranges obtainable are from 54 to 66 cycles or from 58 to 62 cycles for use on 60-cycle systems. The narrow range scales are supplied for use on interconnected systems and applied principally to power or lead dispatching.

Since such an instrument is responsive to changes of 0.01 cycle, frequency changes due to the load can be readily observed. The instrument is more accurate than the usual means available for calibrating. It therefore follows that where several instruments are required for load-dispatching purposes at different points of a system it is preferable to have all these instruments calibrated together, so as to eliminate the effects of individual observation errors in the original calibration, the manufacturing states.